

# OPERATION MANUAL



## **RAMMAX VIPER MODEL RX 1510-C/-I/-CI VIBRATORY TRENCH ROLLER (LOMBARDINI LDW 1003)**

Revision #0 (10/20/10)

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**THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.**

## PROPOSITION 65 WARNING

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**CALIFORNIA — Proposition 65 Warning**

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

**Product identification:**      **Type:**                      RX 1510  
**Model:**                                      -C/-I/-CI  
**Series number:**                        
**Production date:**                     

**Manufacturer:**                      **Rammax Maschinenbau GmbH**  
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**Document identification:**      **Title:**                                      Operating instructions (Translation of the original  
operating instructions)  
**Document number:**  
**Change index:**

**Identification of the machine**

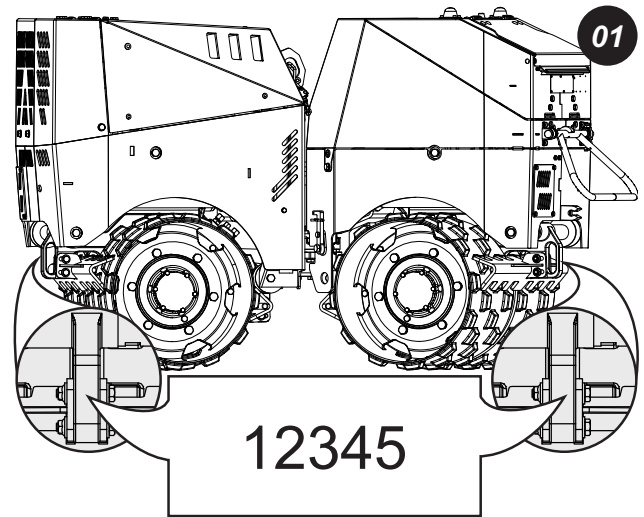
**On transfer of the machine, please complete:**

.....  
Type of machine **03**

.....  
Series number **01**

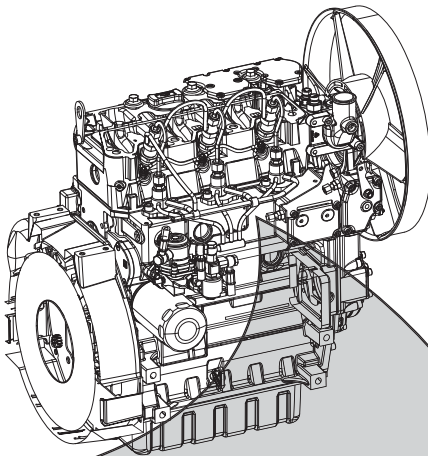
.....  
Engine type

.....  
Motor number **02**

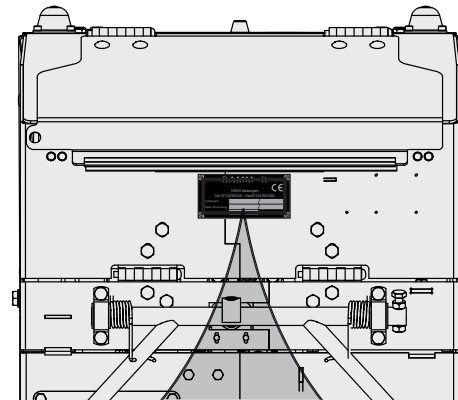


One of our staff or a dealer will instruct you on use and maintenance of the machine at delivery. For this purpose, it is absolutely necessary to observe the safety instructions and danger warnings.

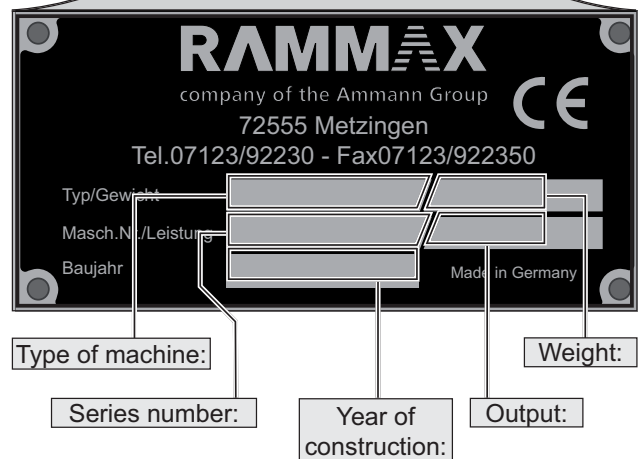
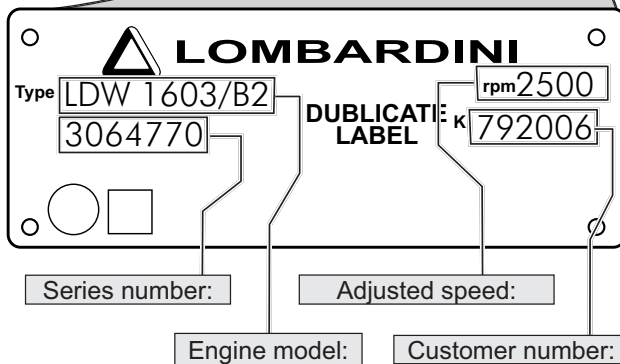
Always indicate the machine series number when ordering spare parts.



**02**



**03**



## General information

The practical development and construction, as well as the experience of many years in manufacturing vibration trench rollers, guarantee that you have a high-quality and extremely reliable machine. The following operating and maintenance instruction comprise:

- Safety regulations
- Operating instructions
- Troubleshooting table
- Description of the machine
- Maintenance instructions

Rammax GmbH accepts no liability for machine function

- In the event of incorrect handling or operation not in compliance with the prescribed mode of operation and procedures,
- If used for other purposes, which do not comply with the intended use (See Intended Use Subsection 1.1.4) or to the specified areas of application (Subsection 1.1.3).

No warranty claims may be asserted in the case of:

- Operating errors,
- Lack of maintenance and/or
- Incorrect operating fluids!

For your own safety and in order not to impair the function of the machine only use Rammax spare parts (Subsection 1.1.7 Changes to the Machine). The spare parts catalogue and the operating instructions are also available in other languages from your Rammax dealer, with specification of the machine number. The warranty and liability conditions contained in the General Terms and Conditions of Rammax GmbH are not extended or replaced by the information contained above or below.

Rammax GmbH Metzingen

### Purpose of the operating instructions:

The use of these operating instructions will:

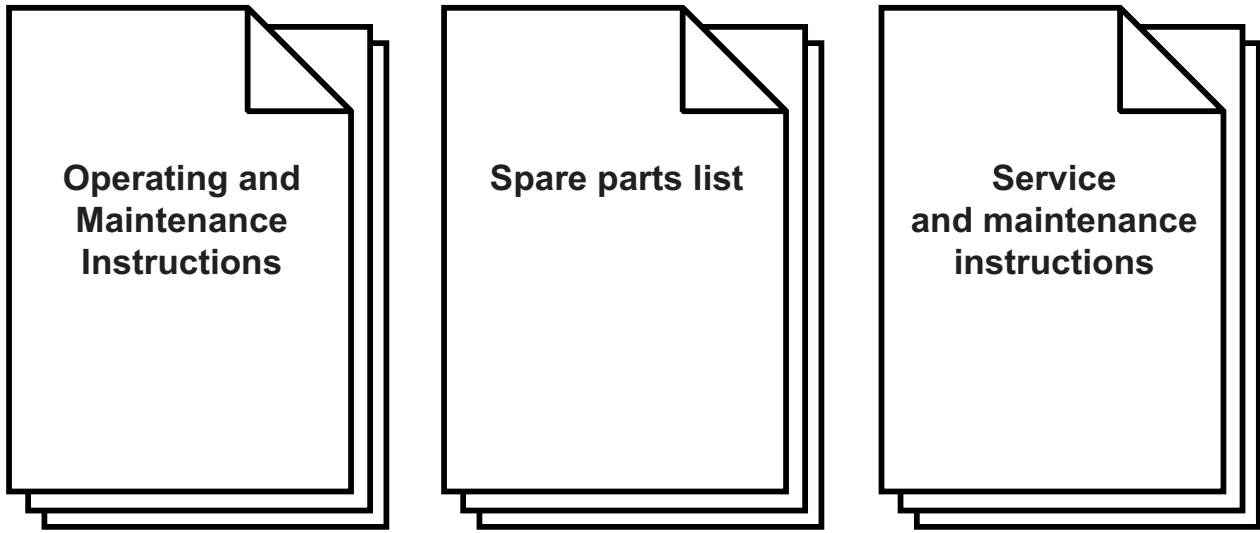
- Simplify the process of familiarisation with your machine.
- Prevent malfunctions due to operating errors.

Observance of the maintenance instructions will:

- Increase the reliability during use on the building site,
- Increase the service life of the machine,
- Reduce repair costs and downtimes.

### Target group:

The operating instructions are addressed to the machine operators. Detailed specifications on the necessary training and qualification can be inferred from Chapter 2.4 Organisational/Personal Matters.

**Structure of the documentation:****The machine documentation is divided into 3 individual document groups:**

- The operating instructions contain: All information necessary for operating the machine. Specifications on the maintenance intervals and accomplishment of the maintenance work
- The spare parts list contains: All available spare parts and part sets
- The service and maintenance instructions contain: The information necessary for maintenance and repair and steps

The individual chapters of the operating instructions contain the following topics:

**Chapter 1:**

- Description of the machine
- Technical data
- Features
- Accessories

**Chapter 2:**

- General safety instructions
- Danger area of the machine
- Safety equipment
- Required qualifications of the operators and of the service staff
- Product specific and additional dangers
- Specifications for an emergency.

**Chapter 3:**

- Construction and function of the machine.

**Chapter 4:**

- Display and control elements
- Operation modes of the machine

**Chapter 5:**

- Start-up of the machine

**Chapter 6:**

- Use of the machine

**Chapter 7:**

- Transport of the machine

**Chapter 8:**

- Maintenance of the machine

**Chapter 9:**

- Tightening torques for bolt connections

**Chapter 10:**

- Troubleshooting table

**Used font weights/typeface**

<b>Chapter heading:</b>	<b>Arial 14Pt Bold</b>
<b>Section heading:</b>	<b>Arial 12Pt Bold</b>
<b>Subsection:</b>	<b>Arial 10Pt Bold</b>
<b>Main text:</b>	Arial 10Pt Regular
<b>Marginal notes and cross references:</b>	<i>Arial 10Pt Italic</i>
<b>Passages to be observed:</b>	<b>Arial 10Pt Bold</b>

Action steps for which a strict sequence must be observed are marked by numbers:

- 1)
- 2)
- 3)

Subsequent steps of the action steps and results of the actions are marked by arrows:



Enumerations are marked by dots:



Subitems within an enumeration or an action step are marked with an indent:



**Pictogram**



**Meaning**

User information



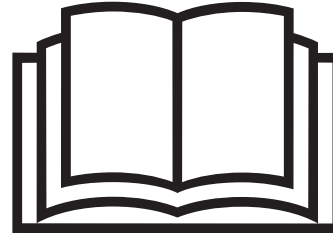
## **Safekeeping and completeness of the operating instructions**

These operating instructions are a firm component of the machine and must be available for the user of the machine, in order to look up. It must always be kept within reach. No chapter of these operating instructions may be removed. Missing instructions or missing pages - particularly the section "Safety instructions" - must be replaced immediately, if they are lost.

The operating instructions must be kept for the service life of the machine and be passed on to each later owner or operator.

Updating service:

These operating instructions are not subject to the updating service of Rammax Maschinenbau GmbH. This documentation can be changed without notification.



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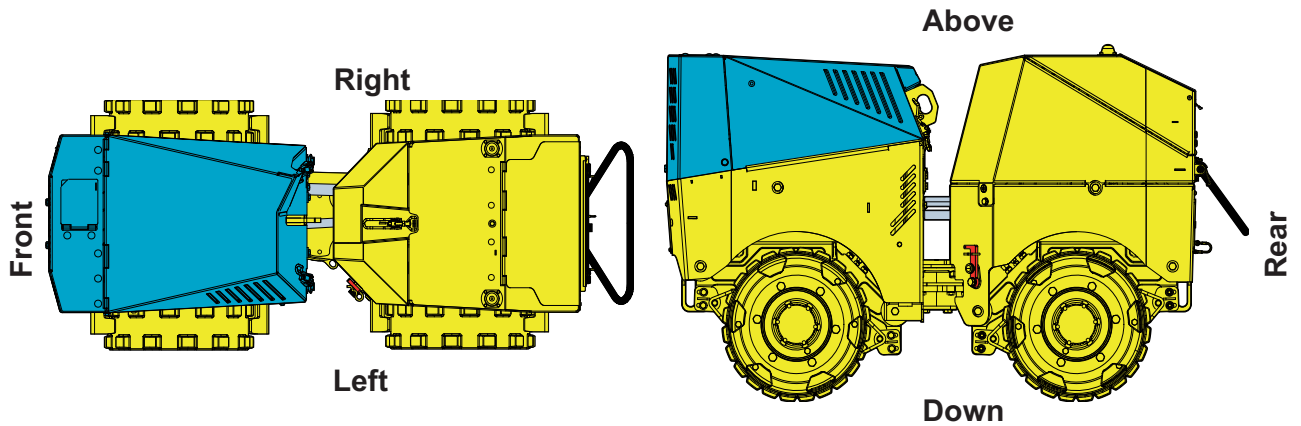
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**1. Description of the machine**

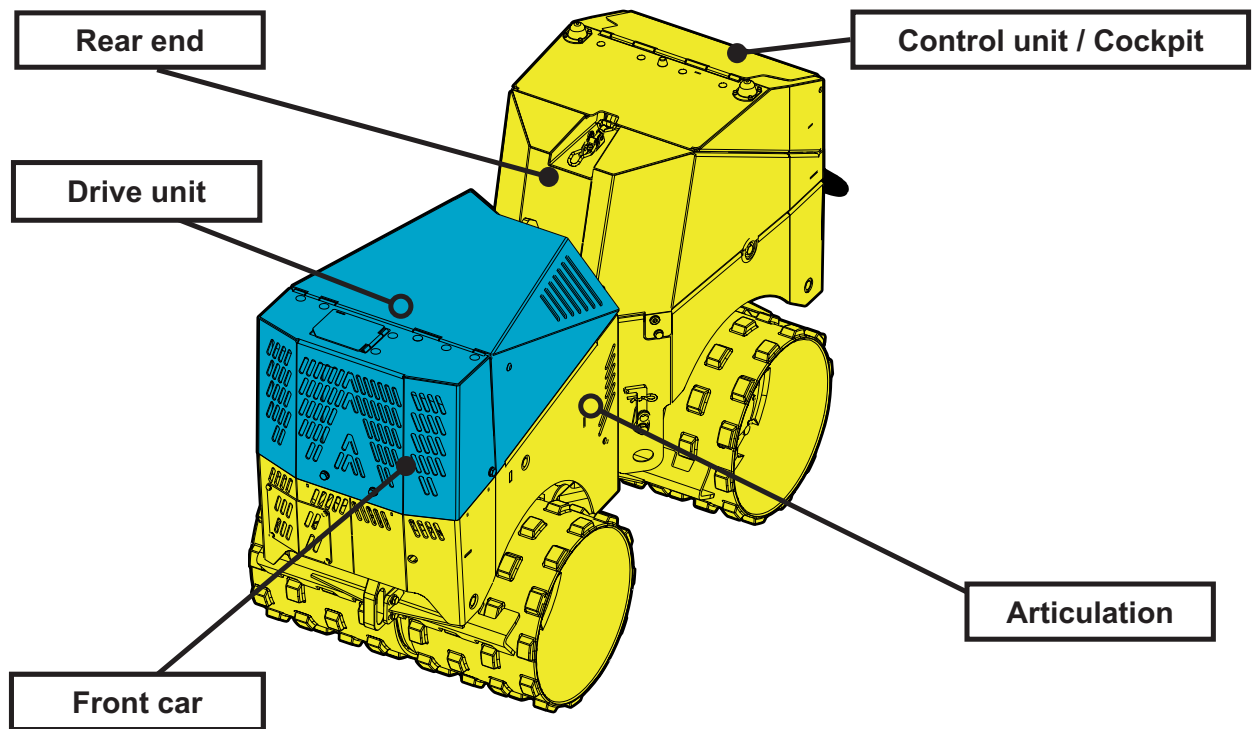
**1.1 Important notes on the machine**

**1.1.1 Orientation on the machine**

The most important areas of the machine are described here, in order to facilitate orientation on the machine. Specifications in the text concerning situation and position are based on the following principle: All specifications on situation or position are to be seen from the cockpit in driving direction. The descriptions are therefore characterised as follows:



**Names of the most important assembly groups:**



**1.1.2 Description**

Our long experience in the development and construction of vibratory trench rollers is the basis for the new development of the infrared and/or cable controlled RX 1510-CI. The enormous degree of operating convenience, which provides both for cable and infrared control, permits the user to make even more flexible use of the machine. The hard-wearing, compact design offers a high degree of security even in the most difficult terrain. The RX 1510-CI is equipped with hydrostatic steering, vibration, and drive. The machine is extremely maintenance friendly (with the exception of the diesel engine), no V-belts, drive belts, lubrication nipples or shiftable clutches are used. Most modern control electronics, as well as the proven 8 strippers for the drums characterise this machine.

**1.1.3 Areas of application**

The vibratory trench roller RX 1510-CI is a roller particularly designed for trench compaction. The complete lack of side walls on the drum enables compaction right up to the trench wall also in very small and narrow trenches. Wet, clayey soils in canalisation, pipeline construction, road substructure and construction backfills, etc., are the ranges of application of this modern trench roller. The infrared control also permits driving underneath bracings when constructing trenches. During dangerous construction-site operations, it is possible for the operator to control the machine from a safe distance and not to expose himself to hazards.

**1.1.4 Intended use**

The machine is exclusively conceived for the compaction of loose backfill, such as earth, gravel, or sand, as well as mixtures of these. The machine may not be used on hard, already compacted or frozen soils.

**1.1.5 Workplace**

The intended workplace of the machine operator is behind the machine. The control switches of the control elements only correspond to the direction of movement of the machine from behind the machine.

**1.1.6 Danger areas**

There is the risk of crushing in the area of the articulation! Staying in this area during operation is not permitted. During operation of the vibration function, loose stones, earth and rubble can be hurled into air. Persons in this area can be hit and injured by these flying around objects. A safety distance of at least 2 meters must be observed around the machine, when the machine is in operation.

**1.1.7 Modifications to the machine**

For reasons of safety, users are prohibited from making their own modifications or conversions to the machine. This machine may only be equipped with original spare parts, which have been constructed for this machine and correspond to the requirements of the manufacturer. The installation or use of special equipment or special parts can impair driving safety.

The manufacturer does not warrant for damages, which result from the use of non-original parts or optional equipment, each adhesion of the manufacturer is impossible and all warranty claims become void.

**Verdichtung**

**RAMMAX**

**EG-Konformitätserklärung**

EC-Declaration of Conformity / Déclaration "CE" de Conformité  
Dichiarazione di conformità CE

**gemäß Maschinen-Richtlinie 98/37/EG, Anhang II A und der Outdoor Richtlinie 2000/14/EG**  
as defined by the Machinery Directive 98/37/EC Annex II A and Noise directive 2000/14/EG  
conformément à la directive "CE" relative aux machines 98/37/CE, Annexe II A et à la directive outdoor 2000/14/EG  
in conformità alla Direttiva sui Macchinari 98/37/CE, Allegato II A et alla Direttiva outdoor 2000/14/EG

**Hersteller (Name und Anschrift):**  
Manufacturer (name and address):  
Fabricant (nom et adresse):  
Costruttore (nome ed indirizzo)

**Rammax Maschinenbau GmbH**  
**Gutenbergstr. 33**

**D-72555 Metzingen**

**Hiermit erklären wir, daß die Maschine (Typ, Versionsnummer)**  
Herewith we declare that the machinery (Type, version number)  
Par la présente, nous déclarons que la machine (Type, numéro de version)  
Con la presente dichiariamo che il macchinario (Tipo, numero di versione)

**Vibrationsgrabenwalze**  
**Vibratory trench roller / Cylindre vibrant pour fossés**

**RX 1510-C-I/-CI / Lombardini LDW 1003 / 3B65E1**

**Nutzleistung:**  
Effective output / puissance utile / capacità utile:

**15,8 kW / 2650 U/min**

**Seriennummer:**  
Serial number / Numéro de série / Numero di serie

**1838728**

**Ordnungsnummer:**  
Ordinal number / Nombre ordinal / Numero ordinale

**8.1**

**folgenden einschlägigen Bestimmungen entspricht:**  
complies with the following provisions applying to it:  
correspond aux dispositions pertinentes suivantes:  
risponde a quanto richiesto dalle seguenti direttive in materia:

**98/37/EG Anhang 11 A; 89/336/EWG; 2000/14/EG**  
**98/37/EC Annex 11 A; 89/336/EC; 2000/14/EC**  
**98/37/CE Annexe 11 A, 89/336/CE, 2000/14/CE**

**Angewandte harmonisierte Normen:**  
Applied harmonized standards: / Normes harmonisées appliquées: /  
Norme armonizzate applicate:

**EN 500-1; EN 500-4**

**Die gemeldete Stelle nach Anhang IX aus 2000/14/EG**  
The notified body according to Annex IX of 2000/14/EC  
L'organisme habilité conformément à l'Annexe IX de 2000/14/CE  
L'ufficio responsabile secondo l'Allegato IX di 2000/14/CE

**TÜV Süddeutschland**  
**Niederlassung Stuttgart**

**D- 70794 Filderstadt**

**wurde (wird) eingeschaltet zur / was (is) engaged for / intervient pour:**  
**è intervenuto (interverrà) per:**

**Konformitätsbewertung nach Anhang VI aus 2000/14/EG**  
valuation of conformity to Annex VI of 2000/14/EC  
conformément à l'Annexe VI de 2000/14/CE  
Valutazione di conformità secondo l'Allegato VI di 2000/14/CE

**An repräsentativem Baumuster gemessener Schalleistungspegel**

**L<sub>WA</sub> nach ISO 3744:**  
Measured sound power level L<sub>WA</sub> of ISO 3744 on represented  
construction model:  
Niveau de puissance de son L<sub>WA</sub> mesuré à ISO 3744 du modèle de  
construction représentatif:  
Livello di potenza sonora L<sub>WA</sub> misurato su un modello  
rappresentativo secondo ISO 3744:

**107 dB(A)**

**Gemessener Schalleistungspegel L<sub>WA,m</sub>:**

Guaranted sound power level:  
Niveau de puissance de son garanti:  
Livello garantito di potenza sonora:

**109 dB(A)**

**Garantierter Schalleistungspegel L<sub>WA,g</sub>:**

Guaranted sound power level:  
Niveau de puissance de son garanti:  
Livello garantito di potenza sonora:

**Verantwortliche Person zur Aufbewahrung der Unterlagen:**

Responsible person for safekeeping the documents  
Personne responsable pour garde des documents  
Persona responsabile per conservazione dei documenti

**Frank Edmaier**  
**Ltg. Konstruktion/Entwicklung**

**Metzingen, 11.4.2008**

**i. A. Stoll, Vertrieb**

**Ort, Datum**  
Place, date / Lieu, date  
Luogo, data

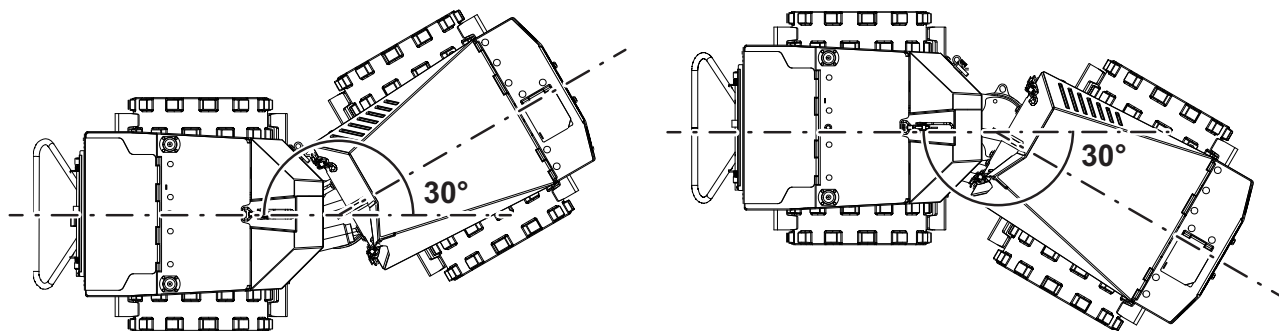
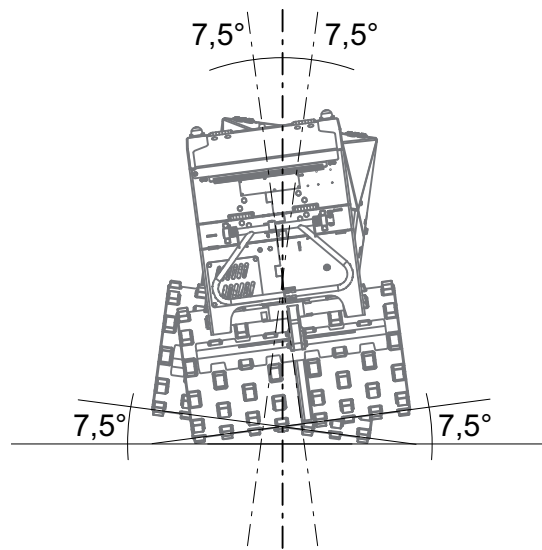
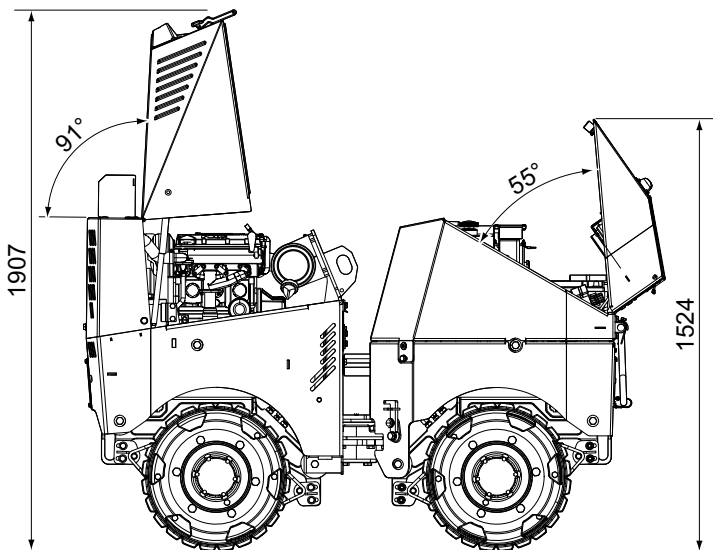
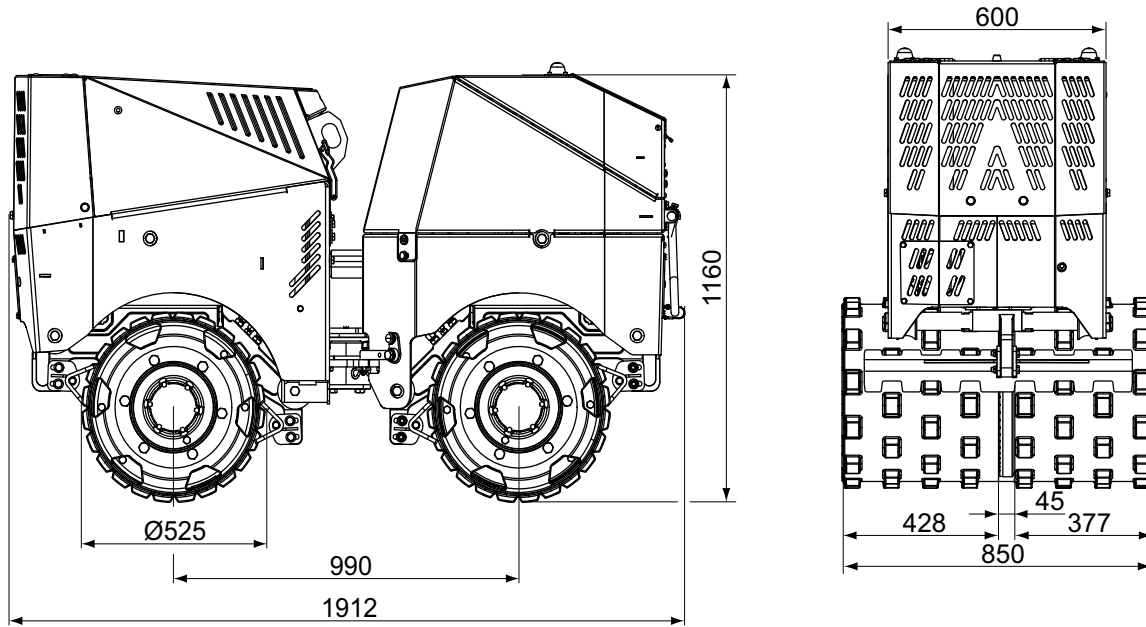
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Signature, acting in the company / Signature, en qualité de  
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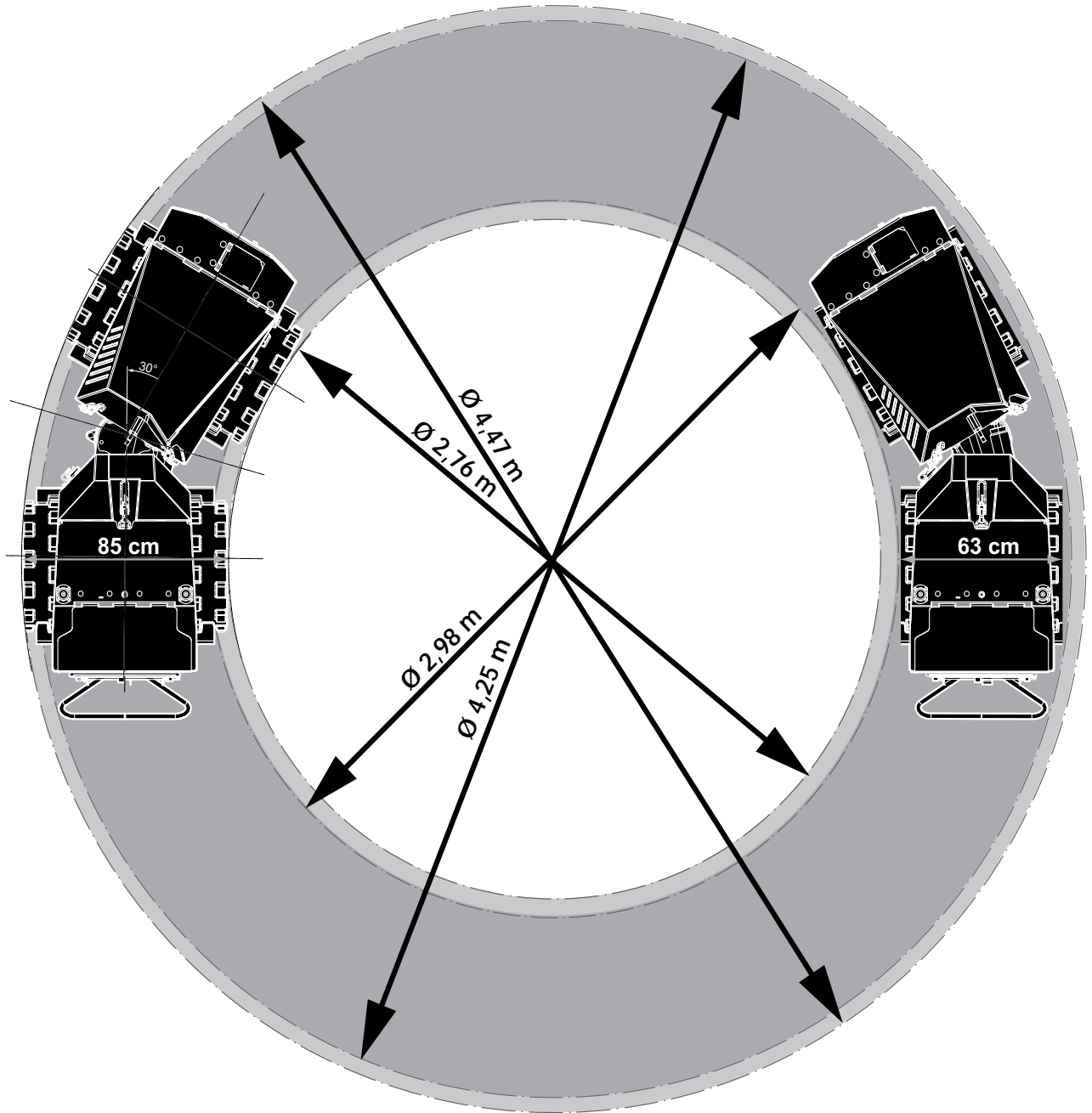


1.2 Technical data

1.2.1 Main dimensions



1.2.2 Turn radius




Main dimensions		RX 1510	
		drum narrow	drum wide
<b>Dimensions:</b>			
Working width:	mm	630	850
Overall width:	mm	630	850
Overall length:	mm	1912	
Overall height:	mm	1175	
Distance between axles:	mm	990	
Drum diameter:	mm	525	
<b>Weights:</b>			
Operational weight:	kg	1470	1530
Axle load front:	kg	735	765
Axle load rear:	kg	735	765
Static line load:	kg/cm	12	9
Dynamic line load:	kg/cm	58	46
<b>Drive system:</b>			
Engine/Type:		Lombardini LDW 1003	
Output:	kW/PS	15,8 / 20,4	
Rotation speed:	max.:	rpm	2850
	idling mixture:	rpm	1350
No. of cylinders/cooling:		3 / Water cooled	
Drive mode:		hydrostatic	
<b>Vibration system:</b>			
Centrifugal force:	with large amplitude:	kN	73
	with low amplitude:	kN	42
Frequency:	with large amplitude:	Hz	41
	with low amplitude:	Hz	41
Rotation speed:	with large amplitude:	rpm	2460
	with low amplitude:	rpm	2460
<b>Driving characteristics:</b>			
Speed:	Working gear:	m/min	16
	High speed:	m/min	38
Steering:		Articulation	
Steering angle:	+/-°	30	
Inclination angle pendulum joint:	+/-°	7,5	

Main dimensions		RX 1510		
		drum narrow	drum wide	
Gradeability w. / w/o. vibration:		%	50/60	
Turn radius	inner:	m	2,98	2,76
	outer:	m	4,25	4,47

**1.2.3 Operating fluids**

		Quantity	Specification	Recommendation
<b>Fuels:</b>				
Diesel fuel:	l	23		
<b>Hydraulics:</b>				
Hydraulic oil:	l	43	DIN 51524-2 HLP 46	Fuchs Renolin B15 VG46
			ISO 6743-4 HM 46	
			ISO 6743-6 CKC 46	
<b>Lubricants:</b>				
Engine oil:	l	2,5	ACEA E2/B3/A3	Fuchs Titan universal 15W40
			API CG-4/SJ	
			MIL-L-2104E	
Bearing grease per	gr	approx. 100	KHLPF2R	Aeronix MoS2
<b>Cooling system:</b>				
Coolant:	l	3,75	Water/ethylene glycol mixture	Fuchs Fricofin S
Freeze protection capability after ASTM D				
	%	10	-4°C	
	%	15	-7°C	
	%	20	-10°C	
	%	25	-14°C	
	%	30	-18°C	
	%	35	-22°C	
	%	40	-28°C	
	%	45	-34°C	Europe
	%	50	-40°C	

	Quantity	Specification	Recommendation
		Use drinkable tap water for making the water/ethylene glycol mixture. Do not use rainwater or distilled water, since this can create foam. The water/ethylene glycol mixture should be used all year round in a concentration of at least 35% by volume.	

**1.3 Noise and vibration specifications**

The noise and vibration specifications listed below in accordance with the EC Machine Directive in the draft (93/68/EEC) were determined under operating conditions typical for the machinery in question with vibration over a specified travel surface (DIN 45635).

In operational application, deviating values may result depending on the prevailing operating conditions.

**Noise emission specification:**

The noise emission specification stipulated in accordance with Annex 1, Section 1.7.4.f of the EC Machine Directive is as follows:

**- Sound pressure level at the operator station: LpA = 89.9 dB(A)**

**- Sound power level: LWA = 103 dB(A)**

These noise emission values were determined in accordance with ISO 6081 for the sound pressure level (LpA) and ISO 3744, DIN 45635, for the sound power level (LWA).

Technical modifications reserved

**Rammax RX 1510**

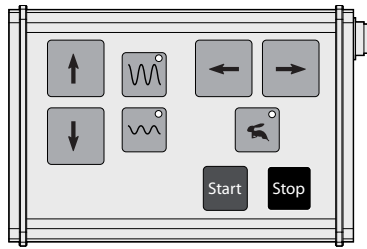
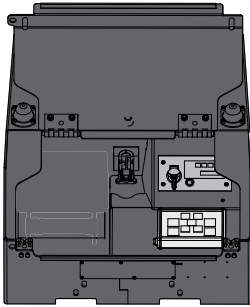
**1.4 Equipment of the machine**

**1.4.1 Variations of the machine/machine types**

View of the operating unit from the workplace.

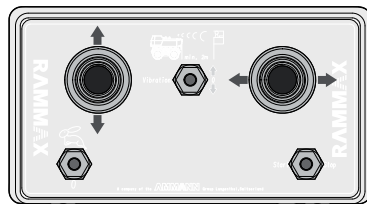
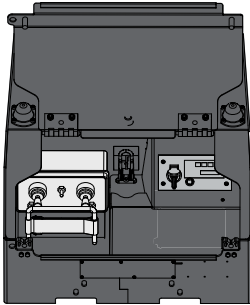
**RX 1510-C:**

Articulated trench roller with cable control.



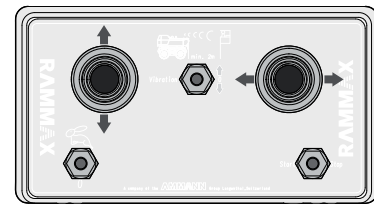
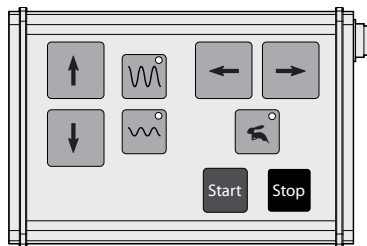
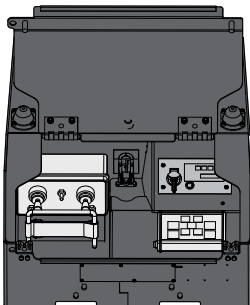
**RX 1510-I:**

Articulated trench roller with infrared control.



**RX 1510-CI:**

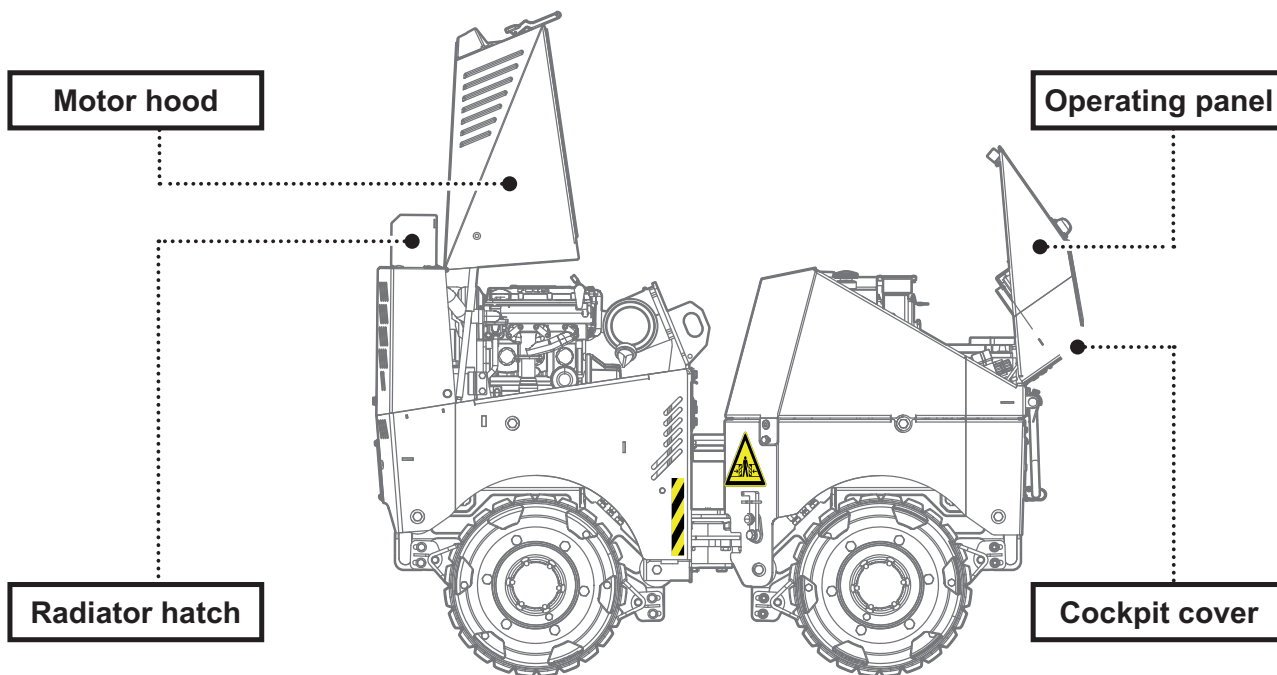
Articulated trench roller with infrared and cable control.



**1.5 Stowage plan**

**15.1 Position of the hoods and hatches**

The machine is equipped with hoods and hinged components in order to be able to access all important parts.



**2. Safety instructions**






**2.1 Representation and meaning of the used safety instructions**

**2.1.1 Situation-specific safety instructions**

Situation-specific safety instructions are safety instructions, which directly refer to the following activity or situation. They are represented as follows:

**DANGER** indicates a dangerous situation, which if it is not avoided can result in **death** or severe **injuries**.

Example safety instruction:


 <b>DANGER</b>
<p><i>Dangerous high voltage Contact causes electric shock Disconnect power supply before service work.</i></p>

Meaning:

<b>RISK LEVEL</b>
<p><i>Nature and source of the danger Possible consequences of the danger/reason for danger Danger prevention measures</i></p>

**WARNING** indicates a dangerous situation, which if it is not avoided can result in **death** or severe **injuries**.

Example safety instruction:


 <b>WARNING</b>
<p><i>Crushing edge Machine starts automatically. Keep hands away from draw-in rollers.</i></p>

Meaning:

<b>RISK LEVEL</b>
<p><i>Nature and source of the danger Possible consequences of the danger/reason for danger Danger prevention measures</i></p>

**CAUTION** indicates a dangerous situation, which if it is not avoided can result in **light or medium severe injuries**.

Example safety instruction:


 <b>CAUTION</b>
<p><i>Danger of burning! Hot surface. Do not touch.</i></p>

Meaning:

<b>RISK LEVEL</b>
<p><i>Nature and source of the danger Possible consequences of the danger/reason for danger Danger prevention measures</i></p>

**NOTE** refers to situations, which **can result in damages to property**, describes the consequences, **if** these situations **cannot be avoided** and indicates possibilities to avoid the damages.

Example safety instruction:


 <b>NOTE</b>
<p><i>Transport protection is still active</i>  <i>Steering movement can damage the transport protection</i>  <i>Release transport protection before using the machine</i></p>

Meaning:

<b>RISK LEVEL</b>
<p><i>Nature and source of the danger</i>  <i>Possible consequences of the danger/reason for danger</i>    <i>Danger prevention measures</i></p>

**ENVIRONMENT** refers to procedures with which the **environment can be endangered** in the case of inappropriate activities.

Example note:

 <b>ENVIRONMENT</b>
<p><i>Leaking motor oil!</i>  <i>Lubricants and chemicals pollute the soil</i>  <i>Collect engine oil in suitable containers and dispose in an environmentally suitable manner according to the regional regulations.</i></p>

Meaning:

<b>RISK LEVEL</b>
<p><i>Nature and source of the danger</i>  <i>Possible consequences of the danger/reason for danger</i>    <i>Danger prevention measures</i></p>

**2.1.2 Chapter and section-specific safety instructions**

At the beginning of each chapter or section, all safety instructions relevant for the chapter or section are collectively specified. They are highlighted in grey and marked by a "Caution!" symbol.



**2.1.3 Used symbols**

**Imperative instructions:**

**Symbol:**

**Meaning:**



**Use hearing protection.**

**Prohibitions:**

**Symbol:**

**Meaning:**



**Do not drive on slopes diagonally**



**Do not transport persons**



**Turn engine off in closed areas**



**Do not use steam jets**

**Warning signs:**

**Symbol:**

**Meaning:**



**Danger**

Special specifications and/or imperative instructions and prohibitions, in order to prevent injury to persons or substantial damages to property are marked with the represented pictogram.  
The appropriate symbol is placed in front, if the source of danger can be indicated accurately



**Danger of tilting**

This sign is placed before activities, in which there is the danger of the machine tilting or overturning.



**Caution downward gradient/upward gradient**

This sign is placed before activities or conditions, during which there is the risk of the machine slipping or overturning.



**Risk of crushing**

This sign is placed before activities, during which there is the risk of being crushed or caught.



**Rotating parts**

This sign is placed before activities, during which there is the risk of limbs being drawn into mechanically moved parts.



**Electricity**

This sign is placed before activities, during which there is the risk of a possibly lethal electric shock.



**Risk of chemical burns**

This sign is placed before activities, during which there is the risk of chemical burns by battery acid.



**Danger of burning**

This sign is placed before activities, during which there is the risk of burning of the skin by hot surfaces.



**Fire danger**

This sign is placed before activities, during which there is an increased risk of fire.



**Risk of explosion**

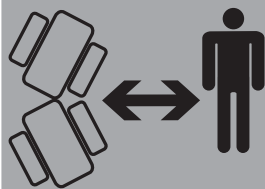
This sign is placed before activities, during which there is the risk of an explosion. The explosion can also be caused by suddenly released pressure.



**Risk of being run over**



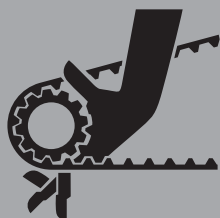
**Risk of overturning**



**Observe distance to articulated joint**



**Danger caused by pressurised liquids escaping**



**Risk for limbs by rotating belts**



**Danger caused by flying around parts**



**Risk caused by inhalation of toxic gases or vapours**





Waste oil disposal/waste oil collecting point



Battery disposal/pollutant collecting point

## 2.2 Intended use/Product safety

The vibration roller RX 1510 is built according to the state-of-the-art and the recognised safety-related regulations. Nevertheless the use can in danger life and health of the user or third parties and/or impair the machine and other material assets:

- It is used in a manner other than its intended use
- It is modified or conversion work is carried out by unqualified persons
- The safety remarks are not observed
- It is not operated or maintained by suitably qualified personnel.

The RX 1510 may only be operated in technically perfect condition as well as intended, with consideration to safety and the ensuing dangers while observing the operating instructions! Malfunctions, which in particular could impair safety must be repaired immediately.

When operating the machine, adherence to the valid accident prevention regulations and the generally accepted rules of safety, as well as country-specific regulations is assumed.

### 2.2.1 Purpose of use of the machine

The section "Areas of application" (Subsection 1.1.3) identifies the purpose, for which the RX 1510 is exclusively intended. Any other or further use is not considered as intended. The manufacturer/supplier is not responsible for such resulting damages. Only the operator is responsible for this risk.

The machine may not be used on hard, already compacted or frozen soils.

The machine is not a playground.

The machine may not be used as means of transport.

The machine is not intended for transporting persons.

The machine must be transported over larger distances.

## 2.3 Danger areas

### 2.3.1 Workplace

The directional and steering switches of the infrared transmitter and cable control only agree with the direction of movement of the machine when used behind the machine. The directional and steering switches react in an opposite manner in front of the machine.

The machine only stops during infrared operation, if the operator approaches it. The machine does not stop during cable control. The machine does not stop, if other persons approach it.

### 2.3.2 Safety equipment

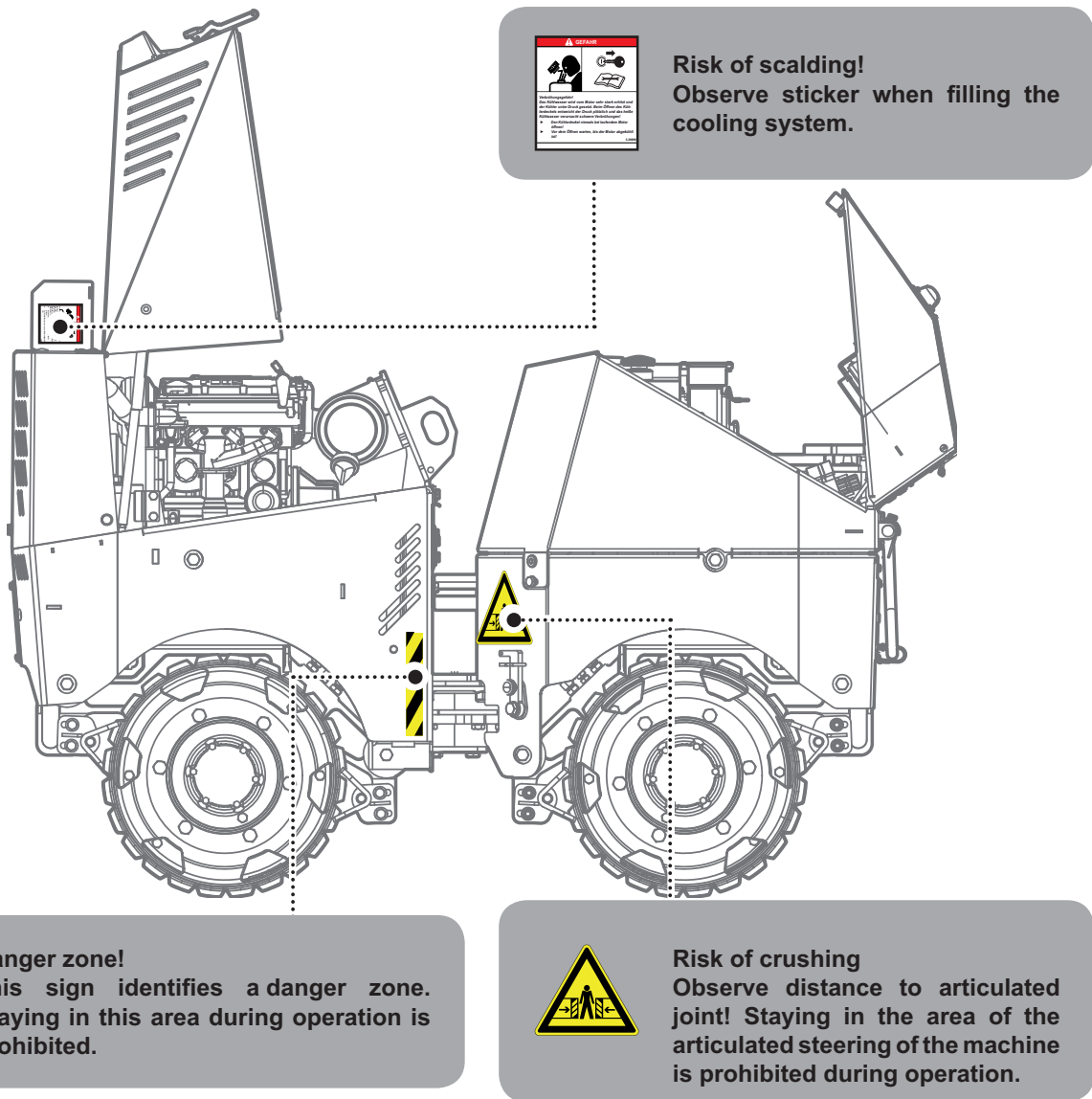
The machine is equipped with various safety equipment. The function of the safety equipment must be checked before operating the machine. The machine may be never operated with defective or missing safety equipment. Do not disassemble, bypass or bridge safety equipment. Defective safety equipment must be replaced immediately. The machine is equipped with the following safety equipment.

- **Shut down yoke**
- **Low distance shutdown**
- **Far distance shutdown**

Position and working principle of the safety equipment are described in more detail on page 44 in section "3.4 Safety and monitoring equipment".

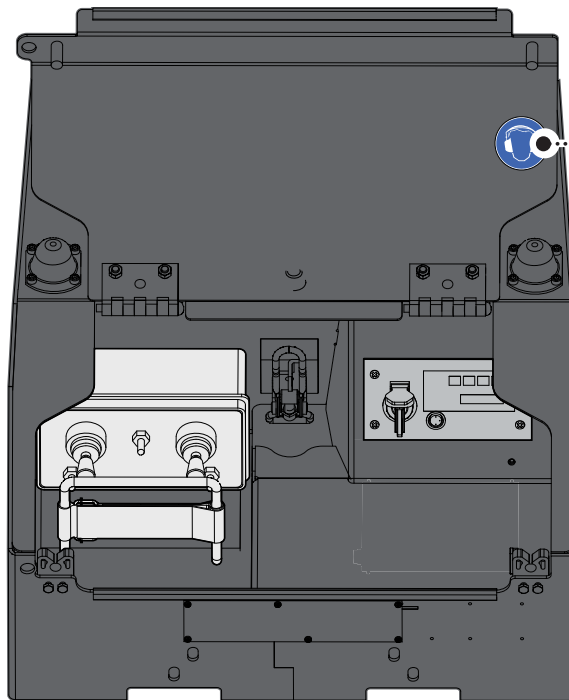
**2.3.3 Observing danger warnings on the machine**

- Ensure that the safety labels and signs are complete and readable.
- Observe the rules and abide by them.
- Immediately renew damaged and illegible safety signs and labels. All signs and labels can be reordered from the spare parts list. The machine may not be used from the time, in which the signs are not clearly recognisable and understandable anymore, until new signs have been attached.





**Use hearing protection.**

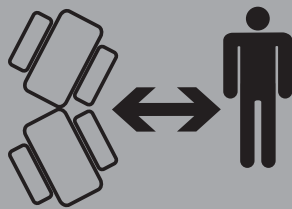


## 2.4 Organisational, personal matters

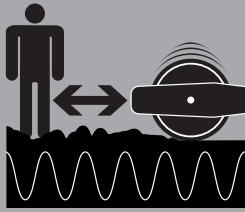
- Machine operation is only admissible after proper instruction and in observance of this manual.
- The safety regulations described in these safety regulations must be observed, likewise the guidelines of the Civil Engineering Professional Association "Safety regulations for the operation of road rollers and soil compactors" as well as the relevant accident protection regulations, the recognised safety-related regulations and country-specific regulations.
- Only qualified and appropriately trained specialised personnel, with a minimum age of 18 years, may operate or maintain the machine. Only trained specialists may carry out maintenance and repair work, which exceeds the scope of these instructions.
- The operating instructions must have been read and understood before carrying out any activity on or with the machine.
- Each person, who is assigned with operation, maintenance, or repair of the machine, must have read and follow the safety regulations. If necessary this must be verified by the applying enterprise by signature of the assigned person of the person.
- Persons acting under the influence of drugs, medicines or alcohol may not operate, maintain or repair the machine.
- Only appropriately trained specialists may carry out work on the electrical system of the machine.
- Malfunctions or damage to the machine must be reported immediately to the person responsible on the building site.
- For reasons of safety, users are prohibited from making their own modifications or conversions to the machine. This machine may only be equipped with original spare parts, which have been constructed for this machine and correspond to the requirements of the manufacturer. The installation or use of special equipment or special parts can impair driving safety.

## 2.5 Product-specific dangers

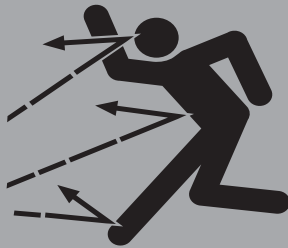
### 2.5.1 During operation



- There is a permanent risk of crushing during operation in the area of the articulated joint. Staying in this area during application is therefore not permitted. Generally, a safety distance of at least 2 meters to the machine must be observed during operation.



- The vibration function of the machine causes the soil in the area of the drum to vibrate considerably. Persons should not be exposed to these vibrations.
- When applying the vibration function, loose material, such as stones and clumps



- of earth, can be hurled through the air. Persons, who are in the vicinity of the drum can be hit and injured by these flying around objects. Therefore observe a sufficient safety distance to the machine, in particular when the vibration function is active.
- Damp and loose substrates substantially reduce the machine's grip on sloping



surfaces and inclines. When driving on inclines and sloping surfaces adjust the speed of the machine to the terrain. Soil condition and weather influences impair the climbing power of the machine. • Never drive up or down slopes steeper than the maximum climbing ability of the machine. Never drive on slopes diagonally Risk of tilting! • Always give way to loaded transport vehicles.

**2.5.2 During maintenance work**



- **The hydraulic system is subject to a high pressure during operation.** Depressurise the hydraulic system before working on it. Only loosen or dismantle parts of the hydraulic system when the diesel engine is turned off.



- Disconnect the battery before working on electrical system components and cover with insulating materials. • Never insert fuses with a higher amperage or repair fuses. Fire danger!



- The machine is operated with Diesel fuel. • When carrying out work on the fuel system, never smoke or expose to a naked flame. Do not carry out welding work on the fuel tank or in the vicinity of unprotected parts of the fuel system. Never operate the machine with loose or missing fuel tank cap.

**2.6 Additional dangers**



Using unexamined, not approved accessories can be dangerous for humans and machine. Only Rammax accessories and spare parts may be used for the machine.



Risk of fire and explosion when using solvent based cleaning agents.

**2.7 Emergency measures**



If the machine touches a power line, never leave the cab until the power has been turned off.

**Emergency equipment**

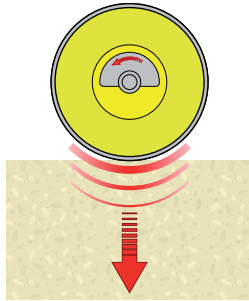
- Always keep a first aid box and a fire extinguisher at hand.
- Keep the emergency telephone numbers for physician, ambulance, hospital, and fire-brigade near to the telephone.



### 3. Construction and function

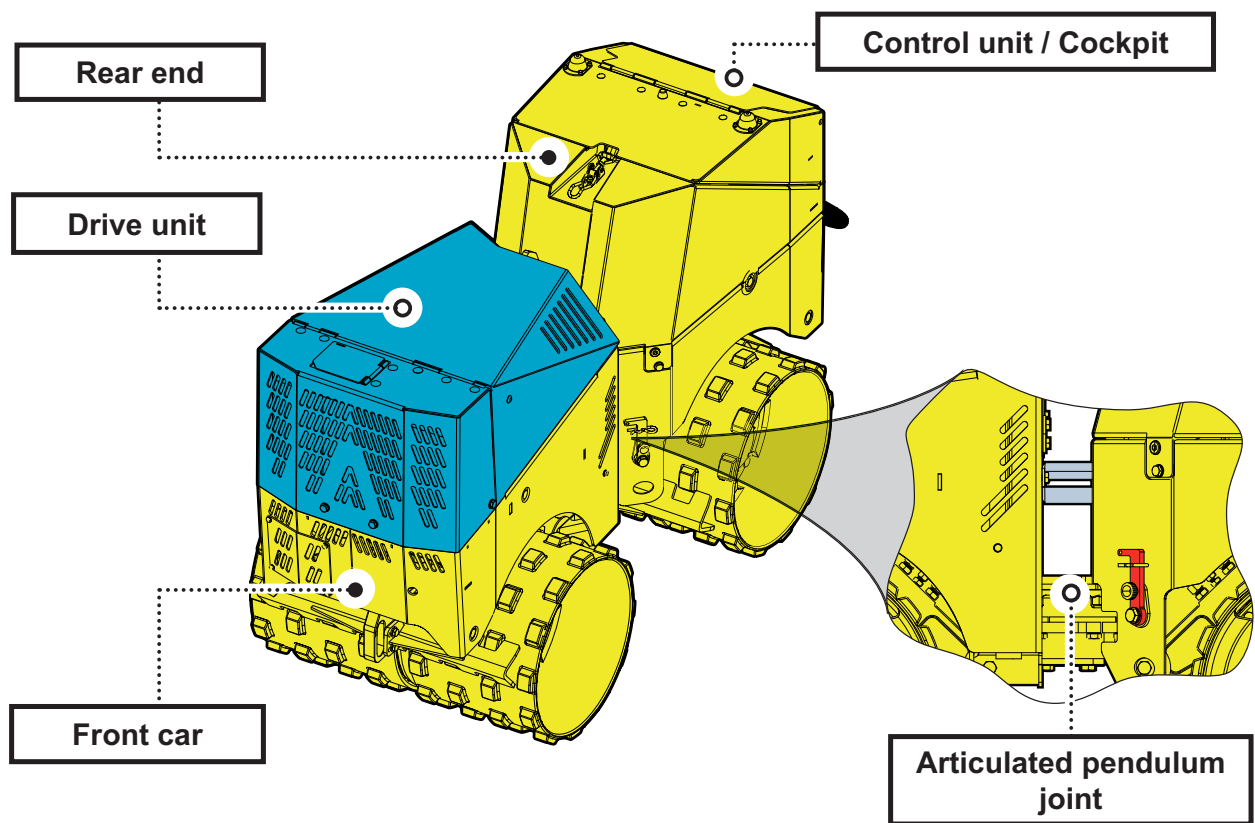
#### 3.1 Introduction

##### 3.1.1 Basic information on soil compaction



Subsoil compaction is achieved by the constant effect of vertical impact forces. These are created by a rotating exciter shaft. The unequal weight distribution of the exciter shaft cross section displaces the exciter shaft and thus vibrates the drum. These vibrations affect the compressed material vertically and compress it.

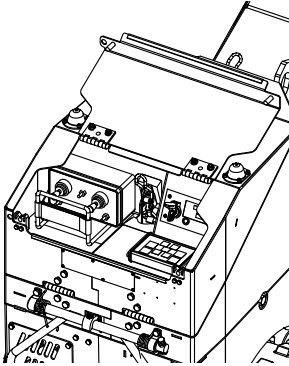
#### 3.2 Mechanical construction





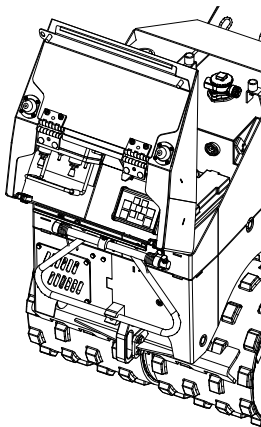
**3.3 Opening and closing of the hoods**

**3.3.1 Opening the cockpit hatch**

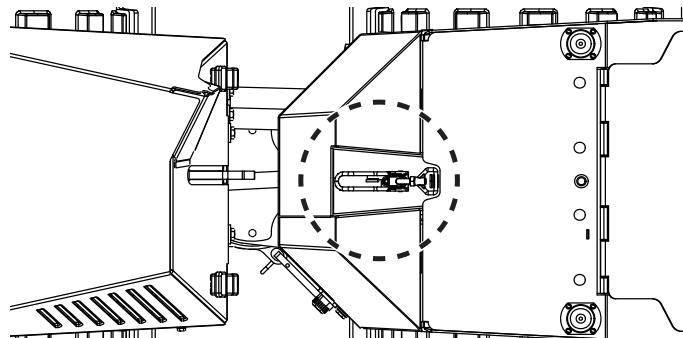


The cockpit hatch is kept closed by two fixtures made of rubber and two bolts as counterparts. In order to open the cockpit hatch, pull it briefly and jerk it upward. To close it push the cockpit hatch down, until it engages audibly in the fixtures. Always make sure that the hatch is correctly latched before operation. If the cockpit hatch is not latched correctly it can be damaged by the occurring vibrations.

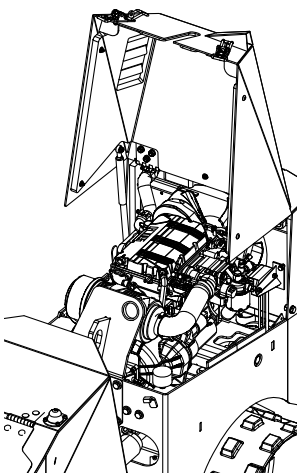
**3.3.2 Turning down the control unit**



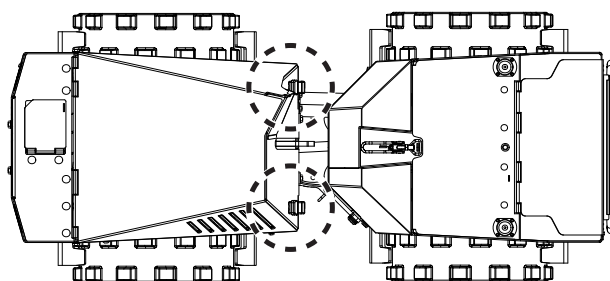
A catch is located in the centre of the control unit. Unlock this catch. Pull the complete operating panel towards you. Make sure that the catch does not get caught in the locking element.

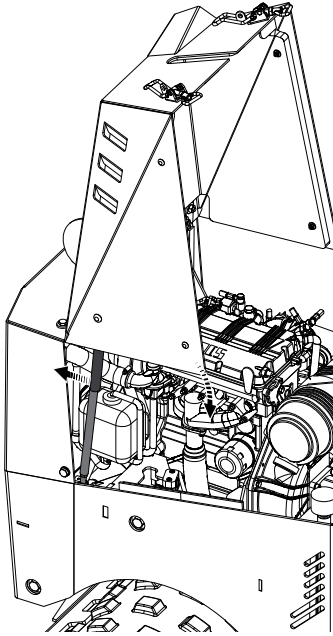


**3.3.3 Opening and closing of the engine hood**

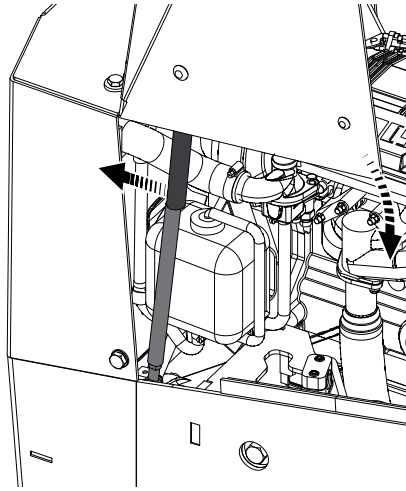


The engine hood can only be opened, if the machine is aligned upright. In order to open the engine hood, unlock the two latches to the left and right of the eyebolt. Fold the catches upward and release the engine hood. The engine hood is equipped with a gas-filled shock absorber, which opens the engine hood and keeps it in an open position.

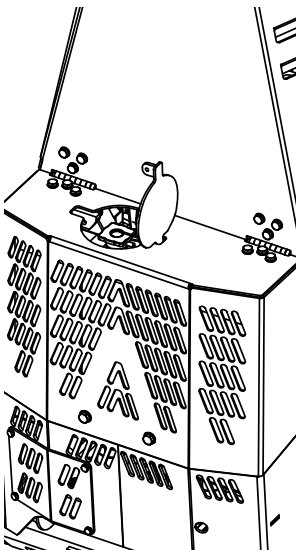




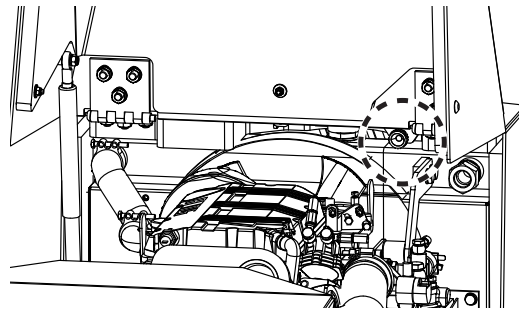
Caution When closing the engine hood and there is the danger of crushing fingers and hands! In order to close the engine hood push the support bushing of the gas-filled shock absorber to the cylinder, while pressing the hood downwards.



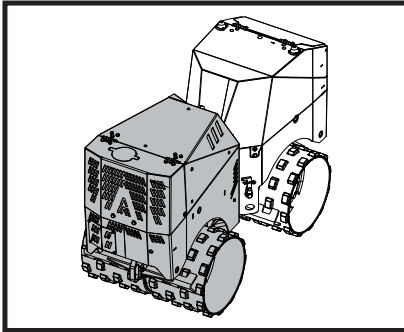
**3.3.4 Unlocking and opening the radiator cap**



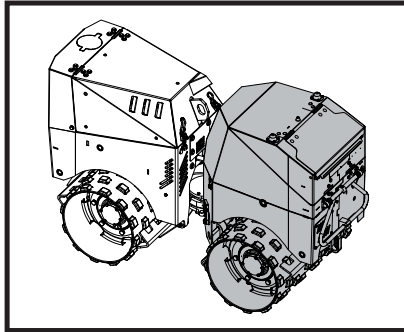
The cooling system is very hot during operation of the machine. The radiator cap may only be opened when the engine has cooled down and is not in operation since there is otherwise the danger of touching parts of the cooling system when opening. The engine hood must be open, in order to open the radiator cap. The unlocking screw is to the right above the radiator. Unscrew this. ► The radiator cap opens. The filler opening of the radiator is located under the radiator cap. To close the radiator cap push it down and screw in the unlocking screw.



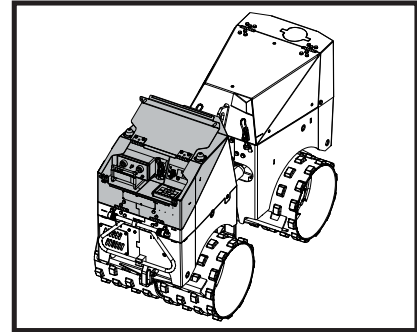
**3.3.5 Components**



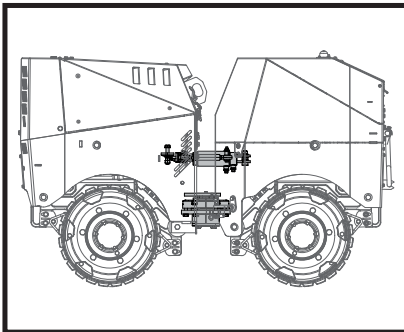
**Front car**



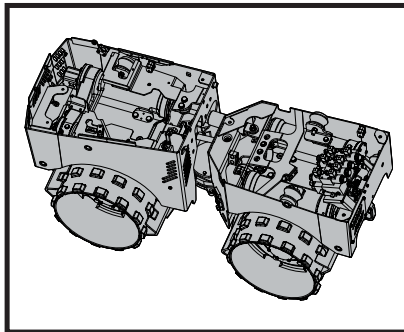
**Rear end**



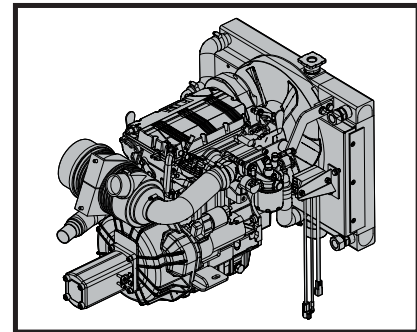
**Control unit / Cockpit**



**Articulation**



**Underframe**



**Drive unit**

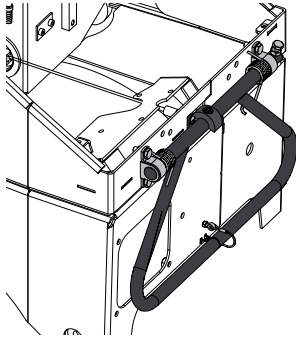
**3.4 Functional description**

The drive unit consists of a diesel engine, vibration, and driving pump. It provides the required hydraulic performance for the driving, steering, and vibration functions.

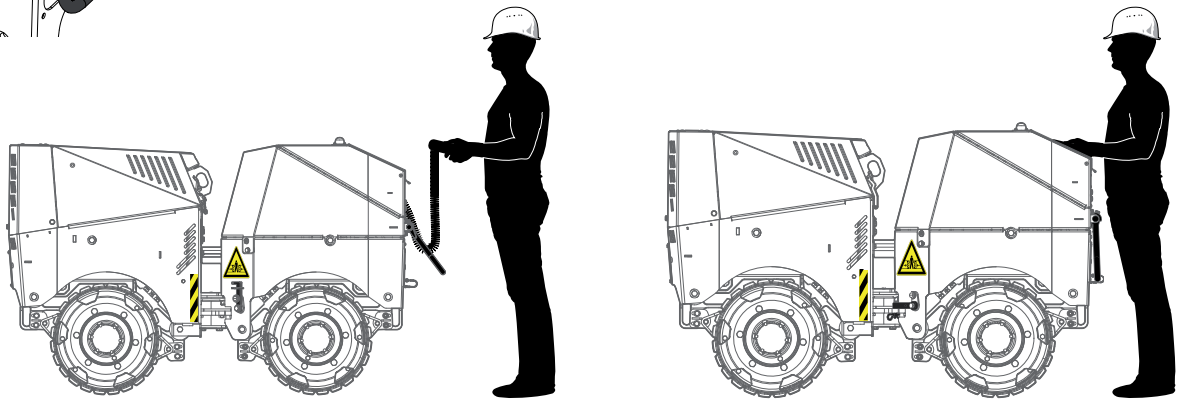
The valve block with the integrated control valves guides the output provided by the driving unit to the connected consumers.

### 3.5 Safety and monitoring equipment

#### 3.5.1 Shut down yoke

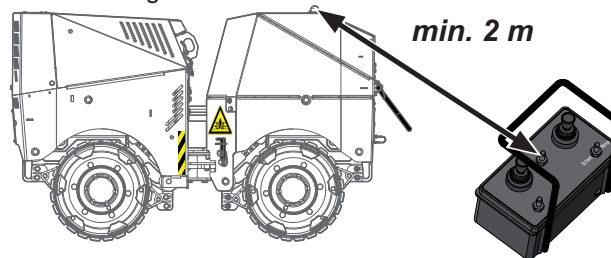


The shutdown yoke is attached to the rear of the machine below the operating unit. At the rear end below the mounting of the shutdown yoke is a proximity switch. The shutdown yoke is activated and the proximity switch triggers, if the machine drives against an obstacle. It thereupon sends a signal to the machine controller and the machine can only be driven away from the obstacle in a forward direction. An active vibration function is switched off. The vibration function must be manually activated again after deactivation of the shutdown yoke. The shutdown yoke must be fastened with the transport strap during transport (transport position).



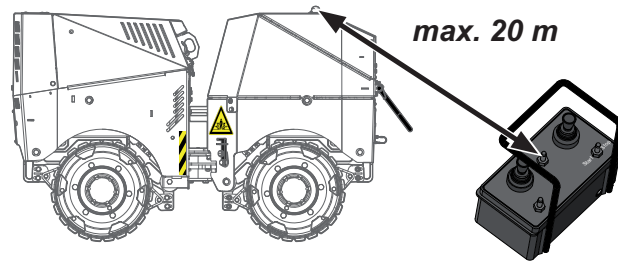
#### 3.5.2 Low distance shutdown (only with infrared control)

The low distance shutdown function is accommodated in the machine controller. The engine continues to run, however all driving functions are deactivated, if the minimum distance between transmitter and receiver is less than 2 meters. The driving functions are available again, as soon as the minimum distance has been attained again.

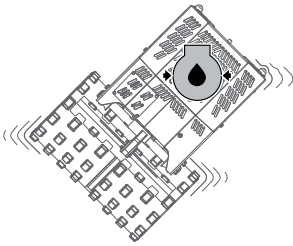


#### 3.5.3 Far distance shutdown (only with infrared control)

The far distance shutdown function is accommodated in the machine controller. The maximum distance between transmitter and receiver depends on the weather and is between 20 and 24 meters. The engine continues to run, however all driving functions are deactivated, if the maximum distance is exceeded. The driving functions are available again, as soon as the distance is less than the maximum distance.



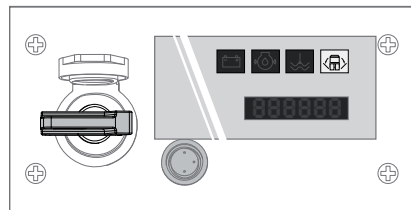
**3.5.4 Inclination indicator**



The machine control is equipped with an inclination indicator. This triggers starting from an inclination angle of 45°. The engine switches itself off in this case automatically. The machine cannot be started as long as the inclination indicator is triggered.

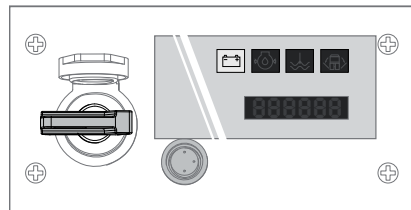
Engine oil can penetrate into the combustion chamber, if the machine has tilted over. The engine could be damaged, if started after straightening up the machine.

- ▶ Uprighting the machine. Do not start the engine.
- ▶ Inform the service workshop.



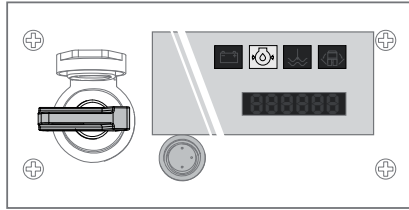
**3.5.5 Automatic switch-off generator failure**

The machine is equipped with an automatic switch-off. The warning light for a generator defect lights up, if no signal is received from the generator. The machine is shut down after the warning light has lit up for 4 seconds.



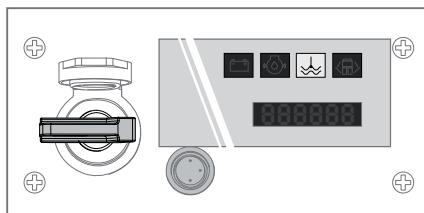
**3.5.6 Automatic switch-off oil pressure**

The machine is equipped with an automatic switch-off. The oil pressure warning light lights up, if the oil pressure drops under the limit value. The machine is shut down after the warning light has lit up for 4 seconds.



**3.5.7 Automatic switch-off cooling water temperature**

The machine is equipped with an automatic switch-off. The temperature warning light lights up, if the cooling water temperature exceeds the limit value. The machine is shut down after the warning light has lit up for 4 seconds.

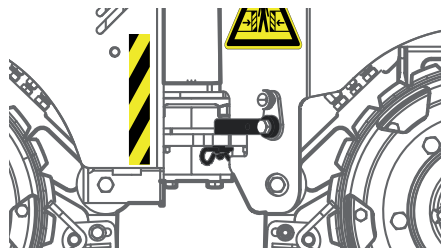


**3.5.8 Automatic speed adjustment**

The machine is equipped with an automatic speed adjustment. The machine controller automatically puts the diesel engine to idle, if no control signal is received from the machine for a period longer than 30 seconds. The machine controller automatically regulates the speed to the maximum speed, if the diesel engine is idling and the machine receives a control signal. The machine is ready for operation.

**3.5.9 Transport protection**

The machine is equipped with a transport protection. The transport protection must always be used when loading and transporting the machine. It prevents the front and rear unit coming into contact (danger of crushing). The transport protection must be removed and stowed away before operating the machine.

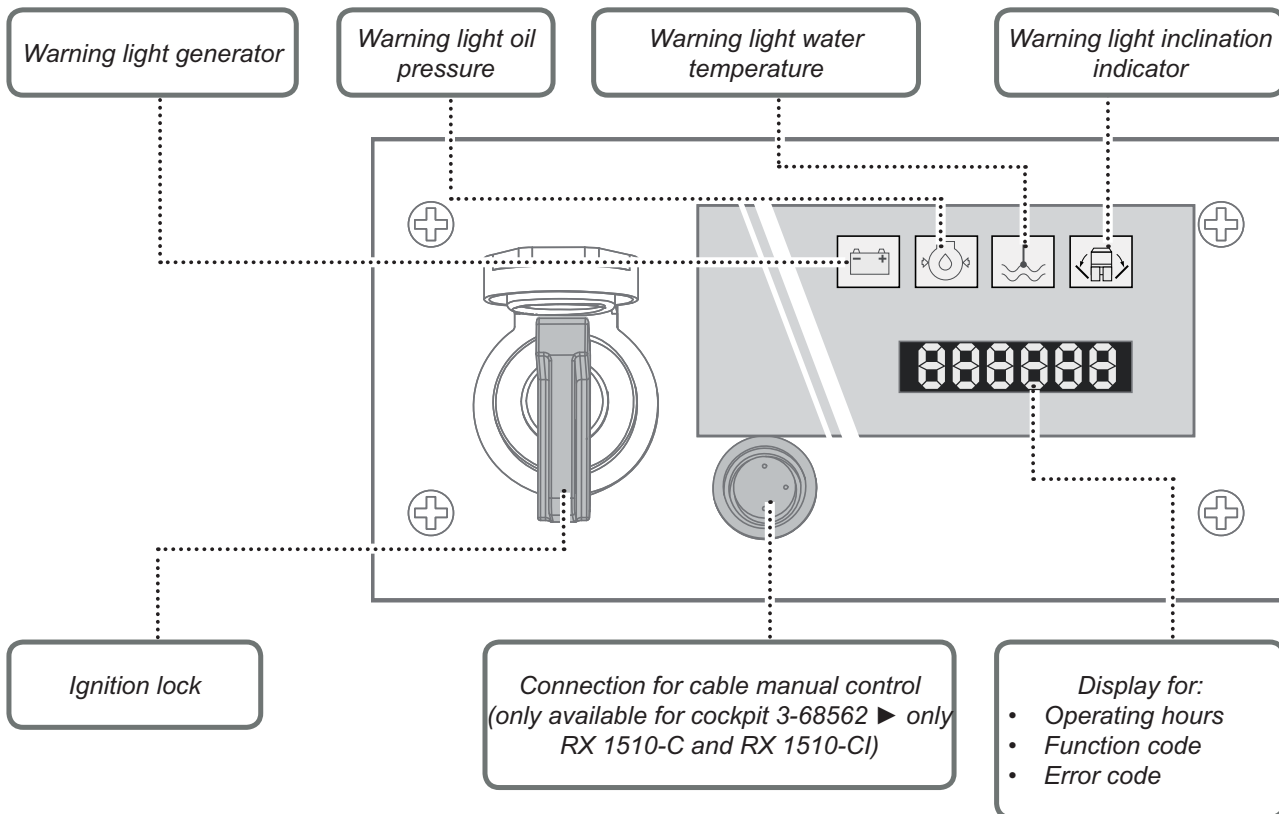


## 4. Display and operating elements

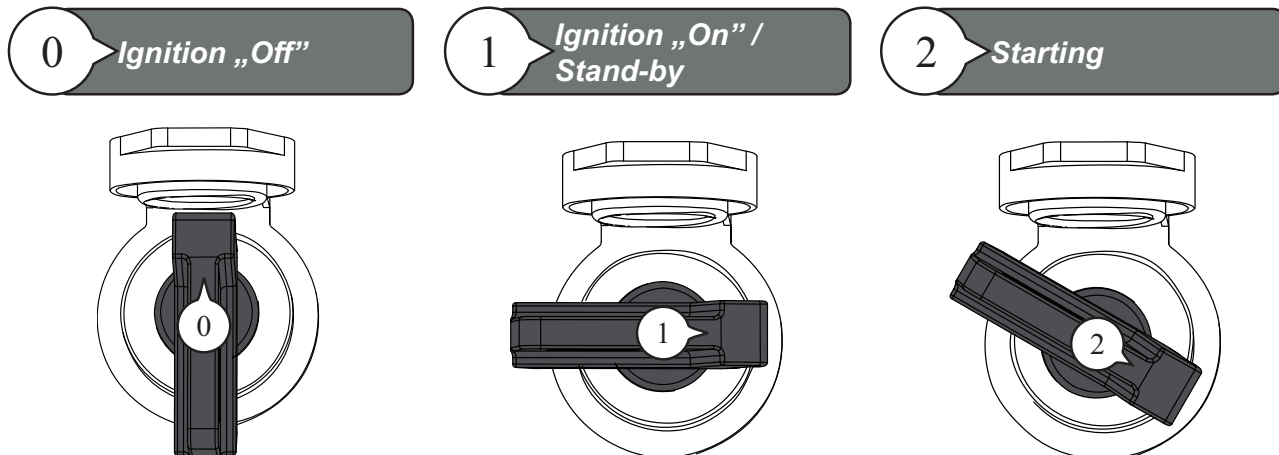
### 4.1 Introduction

The cockpit of the machine is equipped with an electronic display panel. The display panel informs the operator about operating hours, water temperature, oil pressure and malfunctions of the machine.

Before initial start-up, Chapter 5 Start-up and 7.Operation must be read.



#### Ignition positions:



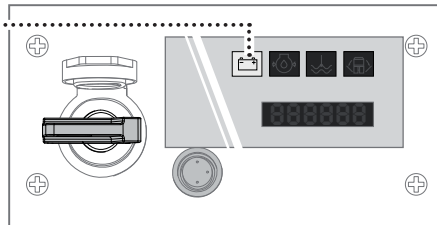
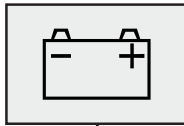
## 4.2 Warning signals

All warning lights light up when switching the ignition on. Troubleshooting is necessary, if one of the warning lights does not light up. If the cause is a defective warning light, this only affects machine safety in as far as a defect will not be indicated by the machine controller and therefore not immediately recognised by the operator. The warning lights extinguish after starting the engine, if there is no malfunction.

- **Charging control light:**

Lights up, if the alternator does not generate voltage. The stop sequence is activated after the LED has been illuminated for 4 seconds. The machine is shutdown.

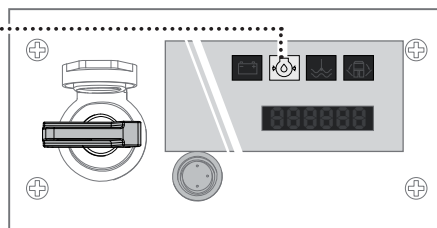
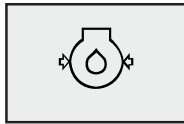
**Possible cause:** Defective alternator. ► Contact service workshop.



- **Oil pressure control light:**

Lights up, if the engine oil pressure drops. The stop sequence is activated after the LED has been illuminated for 4 seconds. The machine is shutdown.

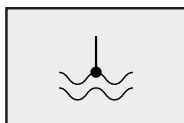
The machine can only be moved again, after the cause of the emergency stop has been eliminated. **Possible cause:** Normally, the engine oil fill quantity is insufficient and engine oil be refilled. See page 84 Section 8.3 Checking engine oil level. **Contact the service workshop for other causes than lack of oil.**



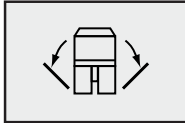
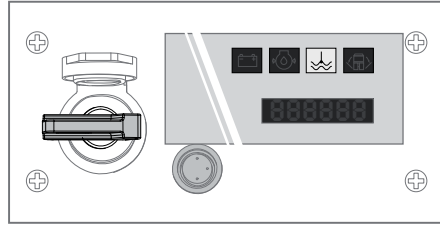
- **Coolant temperature warning lamp:**

Lights up, if the coolant temperature of the motor is too high. The stop sequence is activated after the LED has been illuminated for 4 seconds. The machine is shutdown. **Possible cause:** The cooling water level is possibly too low and cooling water must be refilled. ► See page 89, Section 9.13 Checking cooling water level.

**Contact the service workshop for other causes than lack of cooling water.**





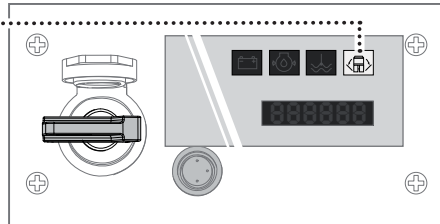


**Inclination indicator / Oil deficiency shutdown**

The machine control is equipped with an inclination indicator. This triggers starting from an inclination angle of 45°. The engine switches itself off in this case automatically. The machine cannot be started as long as the inclination indicator is triggered.

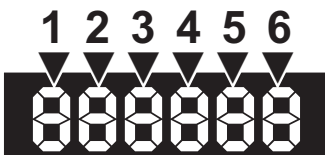
Engine oil can penetrate into the combustion chamber, if the machine has tilted over. The engine can be damaged, if it is started.

- ▶ Uprighting the machine. Do not start the engine.
- ▶ Inform the service workshop.









**4.3 Display elements**

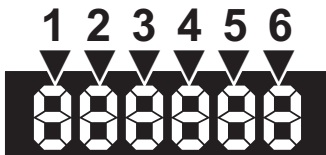
Display:



The display consists of six numbers. The display elements are tested after switching the ignition on. The number 888888 lights up thereby. The cockpit should be exchanged, if a number is not complete.

Display	Meaning	Lights up:
	Function test of the display	<ul style="list-style-type: none"> <li>• When switching the ignition on.</li> </ul>
	<p><b>S:</b> Stands for start function</p> <p><b>05:</b> Address set in the machine controller (The machine is delivered as standard with address 05).</p>	<ul style="list-style-type: none"> <li>• When switching the machine on.</li> <li>• During the starting procedure.</li> </ul>

Display	Meaning	Lights up:
	<p><b>F:</b> Stands for function</p>	<ul style="list-style-type: none"> <li>• If an operator function is carried out.</li> <li>• Always in combination with a numerical value, which represents the function type. (see page 52 Section 4.4.2 Function codes)</li> </ul>
	<p><b>I:</b> Stands for infrared transmitter.</p>	<ul style="list-style-type: none"> <li>• The operator functions are carried out with active infrared control mode.</li> <li>• Always in combination with the display F, for function and a numerical value, which represents the function type.</li> </ul> <p>The code numbers of this function type can be found on page 57-58 Section 4.4.6 Cockpit display with infrared control.</p>
	<p><b>H:</b> Stands for manual control.</p>	<ul style="list-style-type: none"> <li>• The operator functions are carried out with active cable control mode.</li> <li>• Always in combination with the display F, for function and a numerical value, which represents the function type.</li> </ul> <p>The code numbers of this function type can be found on page 53-54 Section 4.4.3 Cockpit display with cable control.</p>
	<p><b>E:</b> Stands for error.</p>	<ul style="list-style-type: none"> <li>• If a function has an error</li> <li>• Always in combination with a numerical value, which represents the function type.</li> </ul> <p>The error codes can be found on page 98-99 Section 10.0 Malfunction table.</p>
	<p><b>Err:</b> Stands for error</p>	<ul style="list-style-type: none"> <li>• If special errors occur.</li> </ul> <p>The error codes can be found on page 98-99 Section 10.0 Malfunction table.</p>
	<p><b>Operating hour meter</b></p>	<ul style="list-style-type: none"> <li>• 1 second after the function test of the display (888888).</li> <li>• Flashes alternating with the starting function S. -- 05, until the engine has started or the cockpit switches to stand-by.</li> </ul>



Code numbers are indicated from position 3 to 6.

- Four-digit code numbers are displayed in combination with "F" (function) which respectively stand for a driving or vibration function. The code numbers for "F" (function) and their meaning can be found on page 52.
- Four-digit code numbers are displayed in combination with "E" (error/special), which respectively stand for a function error. The code numbers for "E" (error) are the same as for the functions.
- 1 or 2-digit code numbers are displayed (position 5 to 6) in combination with "Err" or "FErr" (error/special), which each stand for an error. The code numbers for "Err" or "FErr" (error/special) and their meaning can be found on page 98-99.
- 1-, 2-, or 4-digit code numbers are displayed in combination with "S" (Starting function), dependent on the position of the ignition start switch and/or the starting programme.

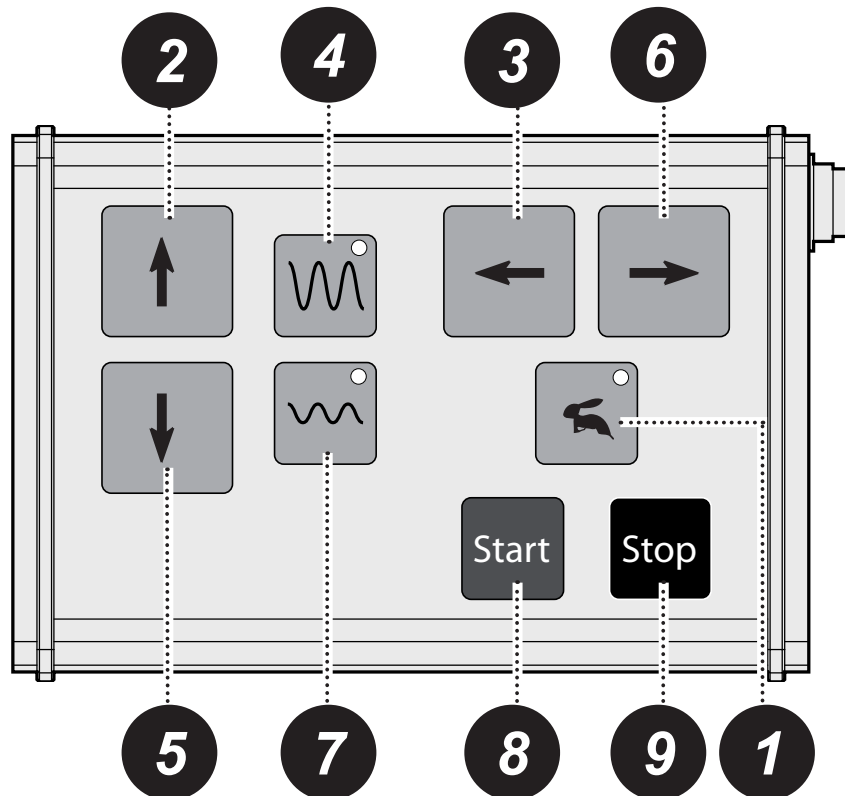
### 4.4 Operating elements

Both infrared control and cable control is available for the machine. According to the machine version it is equipped with one or both of these control methods. Retrofitting one of these control methods is possible without problems. Different operating equipment is required for the control methods.

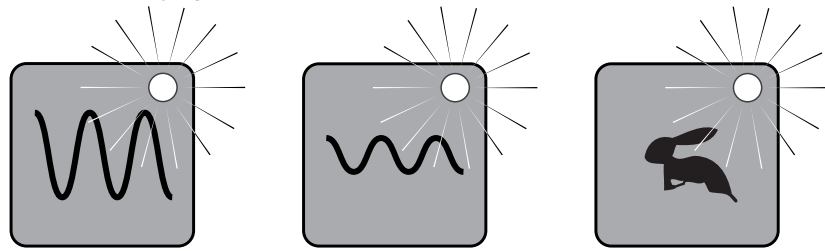
#### 4.4.1 Manual control device

The manual control is used to operate the machine with cable control.

Pos	Function
1	Fast gear on/off
2	Driving forward
3	Steering angle left
4	Vibration forward
5	Driving backwards
6	Steering angle right
7	Vibration reverse
8	Start
9	Machine off



The function keys for vibration with direction of rotation forward, vibration with direction of rotation backwards and fast gear are equipped with a locking function. The key functions remain active until they are actuated again. The respective diode on the key lights up when the function is active.

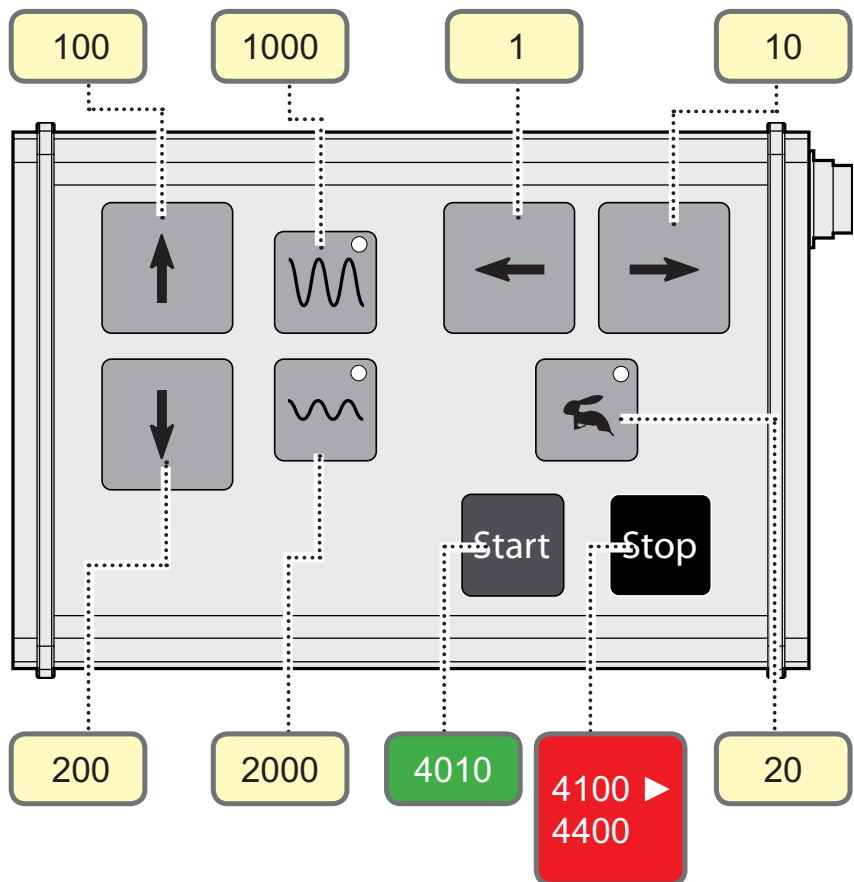


*Function key vibration forward, vibration backwards and fast gear in active condition*

**4.4.2 Function codes during operation with cable control**

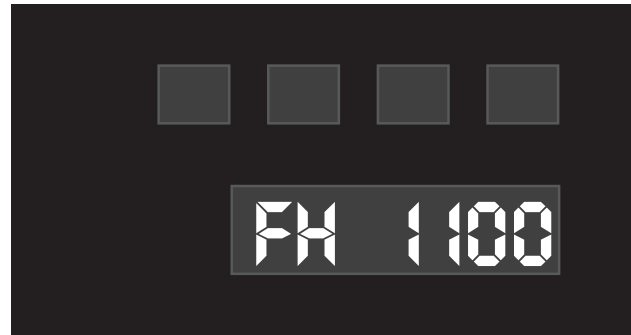
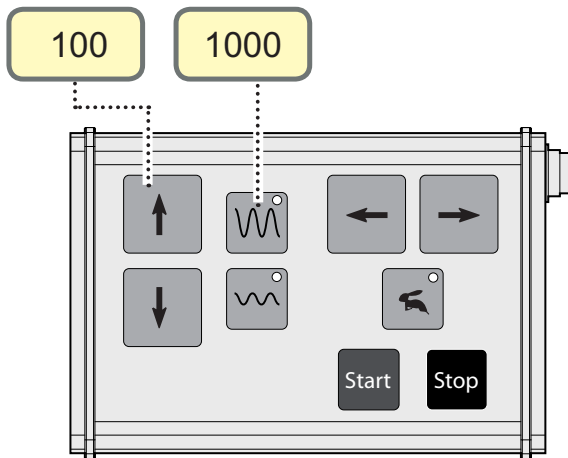
The function codes displays in the cockpit are made up of the code numbers for the individual function keys. Adding the code numbers results in the indicated function codes.

<b>Code number</b>	<b>Meaning</b>
<b>1</b>	Fast gear on/off
<b>10</b>	Driving forward
<b>100</b>	Steering angle left
<b>1000</b>	large amplitude
<b>20</b>	Driving backwards
<b>200</b>	Steering angle right
<b>2000</b>	low amplitude
<b>4010</b>	Start
<b>4100-4400</b>	Machine off



Example display function:

- F H 1100 Driving left forward with vibration forward



**4.4.3 Cockpit display with cable control**

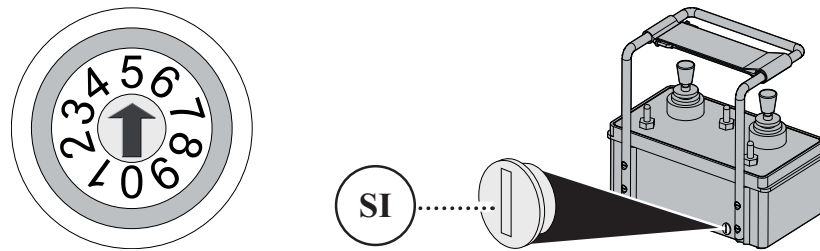
<b>Start / Stop function</b>			
	<b>Control mode</b>	<b>Code number:</b>	<b>Meaning:</b>
F	H	4010	"Start" key is activated. ► Starting procedure is initiated.
F	H	4020	The motor has started. ► Release „Start“ key.
F	-	4050	This error message appears, if the "Start" key is released during the starting procedure, the engine has not yet started and it is set to start again immediately after releasing the "Start" key. This function prevents the starter engaging, while the engine is still in motion.
F	H	4100	"Stop" key is activated. ► Stop procedure is initiated. ► The machine controller waits, until the generator signal, the speed signal and the oil pressure signal are not sent anymore.
F	H	4200	Stop sequence is continued.
F	H	4300	The operating hour meter is secured. K15 is then switched off.
F	H	4400	The operating hour meter is saved.

<b>Driving functions</b>				
<i>Display</i>	<i>Executed functions</i>			
F H 0010	Driving	Right forward		
F H 0011	Driving	Right forward		High speed
F H 0020	Driving	Right backward		
F H 0021	Driving	Right backward		High speed
F H 0100	Driving	Left forward		
F H 0101	Driving	Left forward		High speed
F H 0110	Driving	Left forward	Right forward	
F H 0111	Driving	Left forward	Right forward	High speed
F H 0120	Driving	Left forward	Right backward	
F H 0121	Driving	Left forward	Right backward	High speed
F H 0200	Driving	Left backward		
F H 0201	Driving	Left backward		High speed
F H 0210	Driving	Left backward	Right forward	
F H 0211	Driving	Left backward	Right forward	High speed
F H 0220	Driving	Left backward	Right backward	
F H 0221	Driving	Left backward	Right backward	High speed

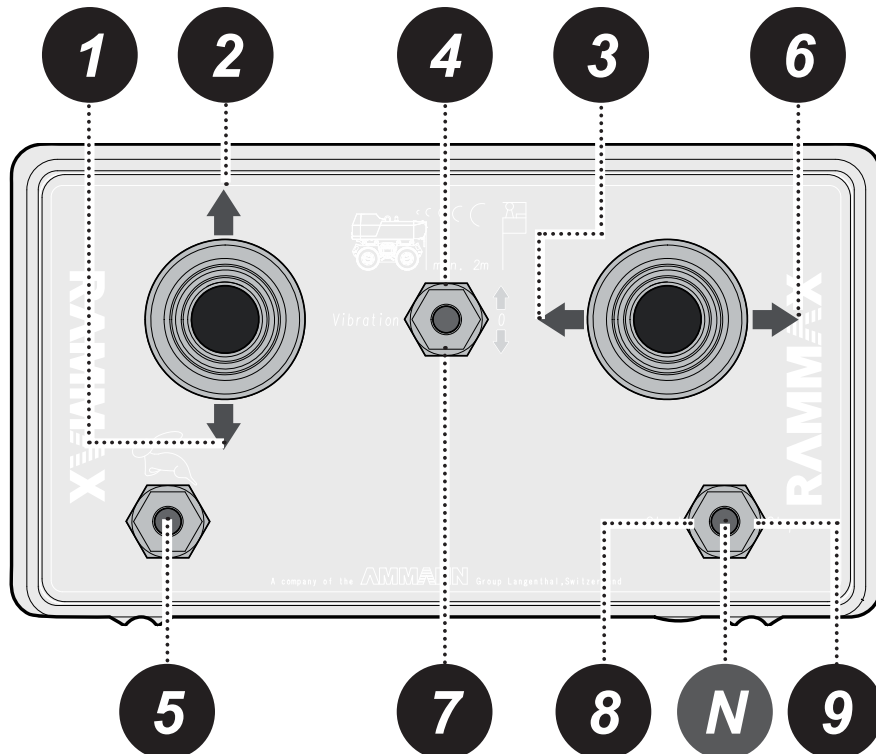
<b>Vibration functions</b>		
<i>Display</i>	<i>Executed functions</i>	
F H 1000	Vibration forward	
F H 1010	Vibration forward	Driving right forward
F H 1020	Vibration forward	Driving right backward
F H 1100	Vibration forward	Driving left forward
F H 1110	Vibration forward	Driving left forward right forward
F H 1120	Vibration forward	Driving left forward right backward
F H 1200	Vibration forward	Driving left backward
F H 1210	Vibration forward	Driving left backward right forward
F H 1220	Vibration forward	Driving left backward right backward
<hr/>		
F H 2000	Vibration reverse	
F H 2010	Vibration reverse	Driving right forward
F H 2020	Vibration reverse	Driving right backward
F H 2100	Vibration reverse	Driving left forward
F H 2110	Vibration reverse	Driving left forward right forward
F H 2120	Vibration reverse	Driving left forward right backward
F H 2200	Vibration reverse	Driving left backward
F H 2210	Vibration reverse	Driving left backward right forward
F H 2220	Vibration reverse	Driving left backward right backward

**4.4.4 Infrared transmitter**

The infrared control is used to operate the machine with infrared control. Solar cells supply the electrical current. Therefore, no batteries are required to operate the infrared transmitter. The infrared transmitter is equipped with freely selectable addresses, in order to transmit the transmitter signal. The machine controller must be set to the same address as the infrared transmitter. The thumb wheel is located under the square plug (SI). This can be screwed off with a screwdriver. The addresses can be set with a small screwdriver by turning the arrow in the middle. If several machines are operating within the same work area, then the machines must be used with differently set addresses. Up to four addresses are available. Therefore, up to 4 machines can be operated by infrared at the same time within the same work area. The addresses 6 to 9 are without function.



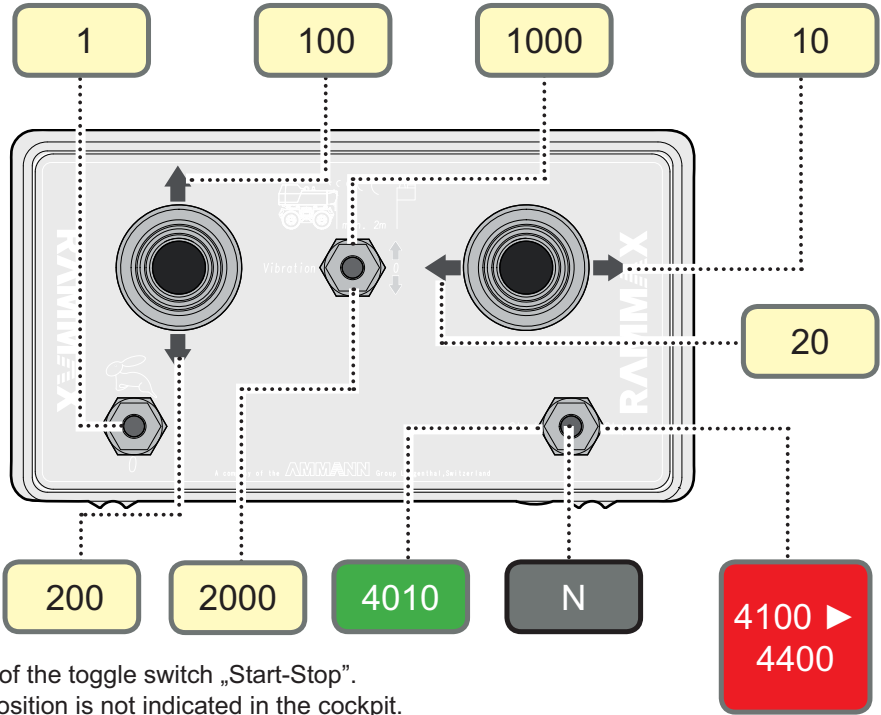
Pos	Function
1	Fast gear on/off
2	Driving forward
3	Steering angle left
4	large amplitude
5	Driving backwards
6	Steering angle right
7	low amplitude
8	Start
9	Machine off
N	Neutral position



4.4.5 Function codes during operation with infrared control

The function codes displays in the cockpit are made up of the code numbers for the individual function keys. Adding the code numbers results in the indicated function codes.

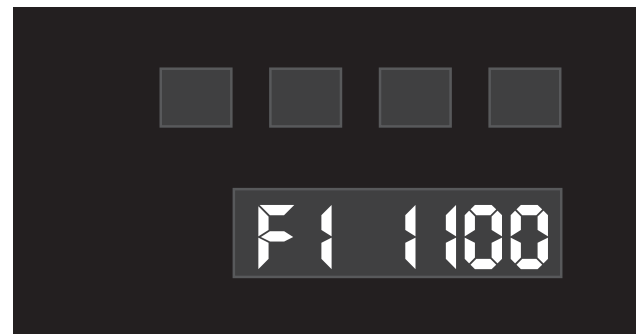
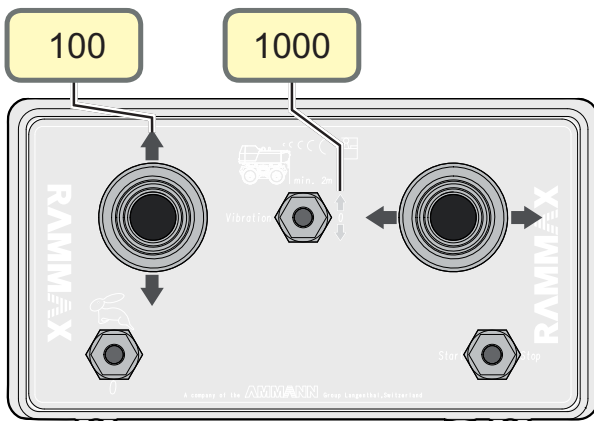
Code	Meaning
1	Fast gear on/off
10	Drums right forward
100	Drums left forward
1000	Vibration forward
20	Drums right backward
200	Drums left backward
2000	Vibration reverse
4010	Start
4100-4400	Machine off / Transmitter off



Neutral position of the toggle switch „Start-Stop”. This switching position is not indicated in the cockpit.

Example display function:

- F I 1100 Driving left forward with vibration forward





**4.4.6 Cockpit display with infrared control**

<b>Start / Stop function</b>			
<i>Characteristic</i>	<i>Control mode</i>	<i>Code number:</i>	<i>Meaning:</i>
F	I	4010	Toggle switch „Start” is activated. ► Starting procedure is initiated.
F	I	4020	The motor has started. ► Release toggle switch „Start”.
F	-	4050	This error message appears, if the toggle switch is released during the starting procedure, the engine has not yet started and it is set to start again immediately after releasing the toggle switch. This function prevents the starter engaging, while the engine is still in motion.
F	I	4100	Toggle switch „Stop” is activated. ► Stop procedure is initiated. ► The machine controller waits, until the generator signal, the speed signal and the oil pressure signal are not sent anymore.
F	I	4200	Stop sequence is continued.
F	I	4300	The operating hour meter is secured. K15 is then switched off.
F	I	4400	The operating hour meter is saved”.

<b>Driving functions</b>				
<i>Display</i>		<i>Executed functions</i>		
F I	0010	Driving	Right forward	
F I	0011	Driving	Right forward	High speed
F I	0020	Driving	Right backward	
F I	0021	Driving	Right backward	High speed
F I	0100	Driving	Left forward	
F I	0101	Driving	Left forward	High speed
F I	0110	Driving	Left forward	Right forward
F I	0111	Driving	Left forward	Right forward High speed
F I	0120	Driving	Left forward	Right backward
F I	0121	Driving	Left forward	Right backward High speed
F I	0200	Driving	Left backward	
F I	0201	Driving	Left backward	High speed
F I	0210	Driving	Left backward	Right forward
F I	0211	Driving	Left backward	Right forward High speed
F I	0220	Driving	Left backward	Right backward
F I	0221	Driving	Left backward	Right backward High speed

<b>Vibration functions</b>		
<i>Display</i>	<i>Executed functions</i>	
F I 1000	Vibration forward	
F I 1010	Vibration forward	Driving right forward
F I 1020	Vibration forward	Driving right backward
F I 1100	Vibration forward	Driving left forward
F I 1110	Vibration forward	Driving left forward right forward
F I 1120	Vibration forward	Driving left forward right backward
F I 1200	Vibration forward	Driving left backward
F I 1210	Vibration forward	Driving left backward right forward
F I 1220	Vibration forward	Driving left backward right backward
<hr/>		
F I 2000	Vibration reverse	
F I 2010	Vibration reverse	Driving right forward
F I 2020	Vibration reverse	Driving right backward
F I 2100	Vibration reverse	Driving left forward
F I 2110	Vibration reverse	Driving left forward right forward
F I 2120	Vibration reverse	Driving left forward right backward
F I 2200	Vibration reverse	Driving left backward
F I 2210	Vibration reverse	Driving left backward right forward
F I 2220	Vibration reverse	Driving left backward right backward

## 5. Start-up

### 5.1 Safety instructions



Only qualified and appropriately trained specialised personnel, with a minimum age of 18 years, may operate the machine. Persons acting under the influence of drugs, medicines or alcohol may not operate the machine.

### 5.2 Examination before start-up

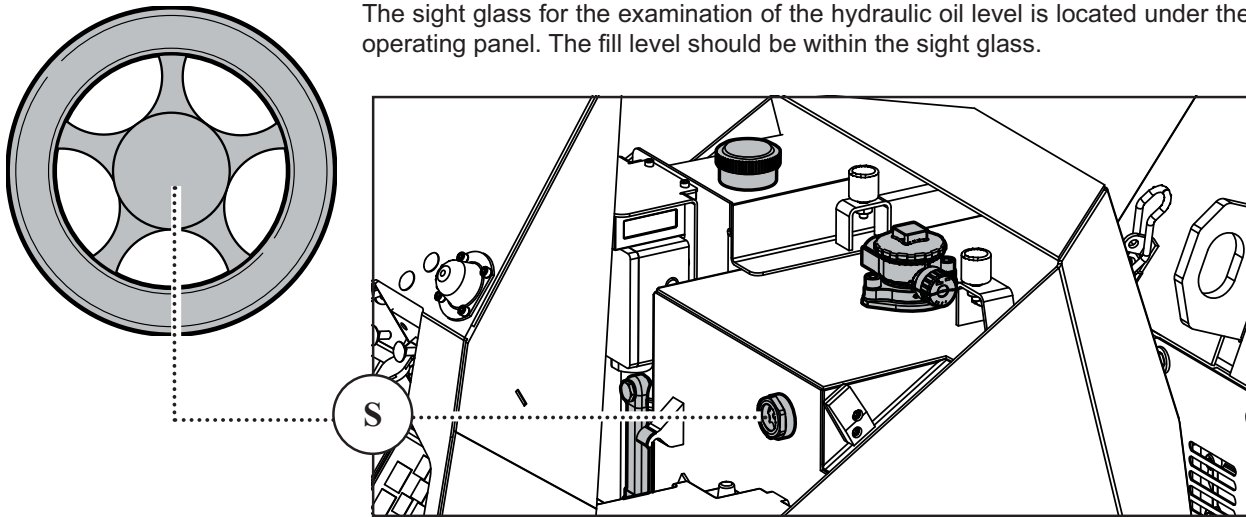
Before putting the machine into service every day or before a long work period, the following checks must be performed. The safety regulations must be observed hereby.

The following must be checked:

- The function of all safety equipment
- Whether the transport protection has been removed
- All bolt connections for firm fit
- Fuel tank and fuel lines for leaktightness
- Machine and engine for damages
- Function of the control elements
- Function of the steering system
- Hydraulic system for leaktightness

#### 5.2.1 Checking hydraulic oil level

The sight glass for the examination of the hydraulic oil level is located under the operating panel. The fill level should be within the sight glass.

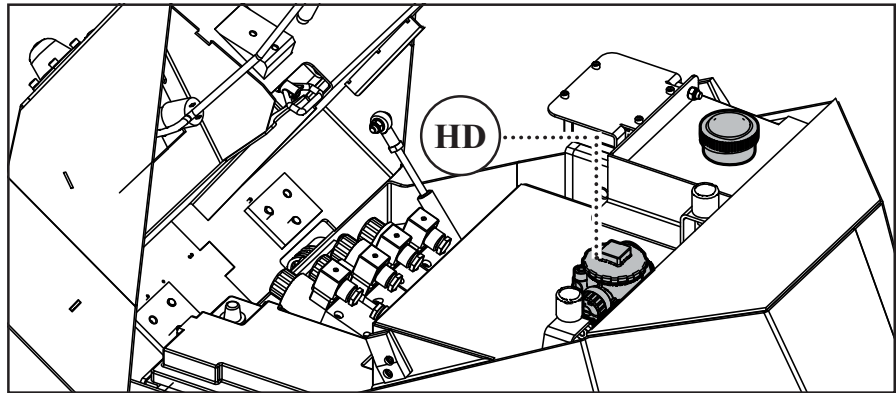


**NOTE**

*If it is determined during the daily oil level check that hydraulic oil is missing, immediately examine all aggregates, lines, and hoses for leaktightness and fill up missing hydraulic oil before beginning work.*

**Refilling hydraulic oil:**

- 1) Open (HD) cap.
- 2) Fill in hydraulic oil until the fill level is located between the markings.

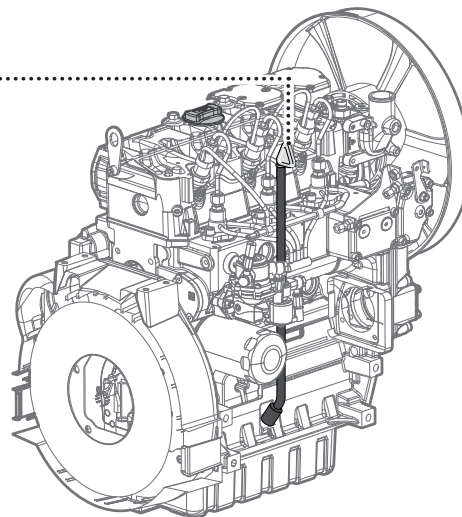
**5.2.2 Checking engine oil level**

(OS) The dipstick is located on the right side of the engine underneath the cooling water tank. The engine has been filled in the factory with engine oil, viscosity class 15W40. If there is the need to change to a different viscosity class (e.g.: permanent extreme outdoor temperatures), the oil must be changed.

- 1) Park the machine on flat ground.



(OS)



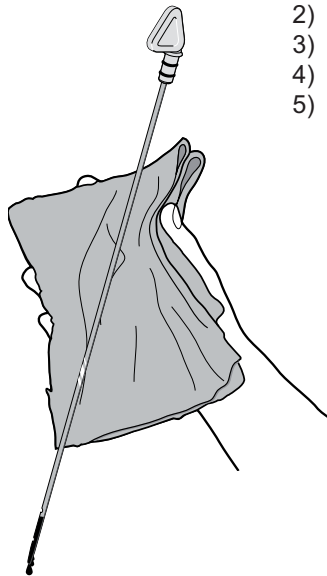


**CAUTION**

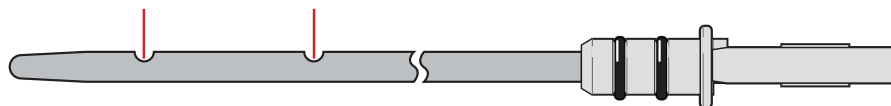
**Danger of burning!**

*The engine and its detachable parts are hot during and immediately after operation.*

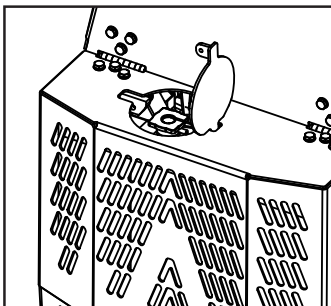
*Before touching the engine or the detachable parts first allow these to cool down.*



- 2) Pull the dipstick out.
- 3) Wipe the dipstick with a dry, fibre-free rag.
- 4) Insert the dipstick up to the stop in its fixture.
- 5) Pull the dipstick out again and read the oil level. ► The oil level should be between the two markings. More engine oil must be filled in, if the oil level is too low (only use engine oils with the same viscosity).



**5.2.3 Checking cooling water level**



Work may only be carried out on the cooling system when the diesel engine has cooled down. The machine must be parked on a level ground. The cooling water level is examined directly at the radiator. The compensating tank only serves as a buffer in order to take up water during expansion by the thermal effect and keep it in the cooling circuit. The engine hood and the radiator hatch must be open, in order to check the cooling water level.

The radiator must be completely filled. Coolant must be refilled, if the fill level is too low.

A radiator anti-freezing agent must be used in frost-endangered areas. The radiator has been filled in the factory with a radiator anti-freezing agent/water mixture. This mixture is adjusted to a temperature resistance of up to -30°C.



**DANGER**

**Risk of scalding!**

*The engine extremely heats up the cooling water. The radiator is under pressure.*

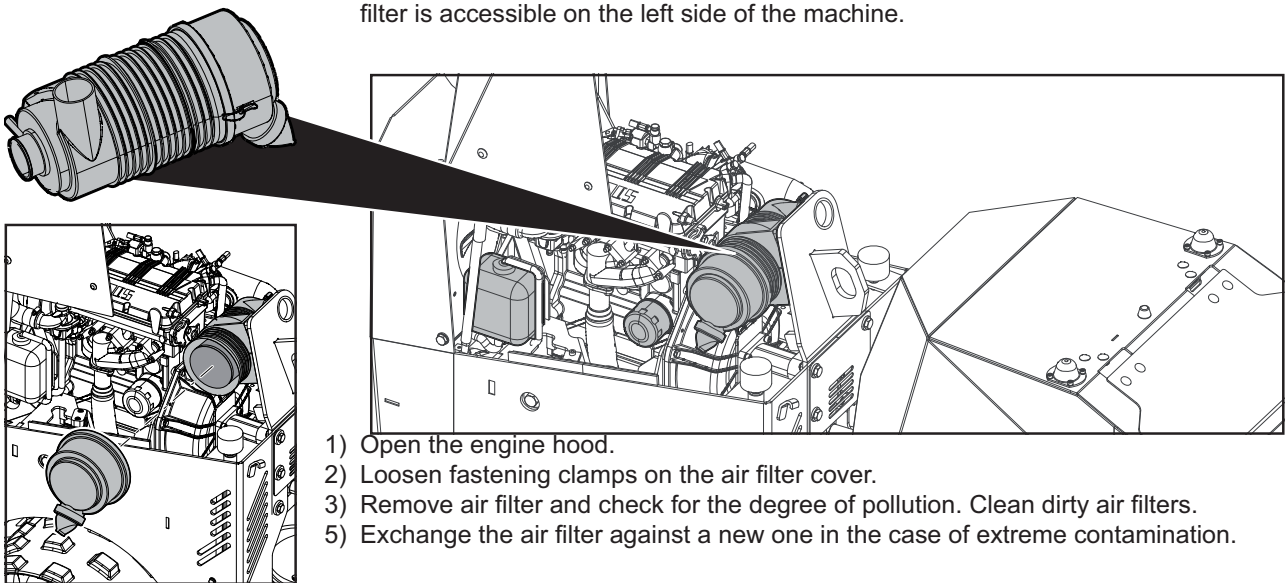
*When opening the radiator cap the pressure can escape suddenly and the hot cooling water can cause severe scalding!*

- *Never open the cap of the radiator when the engine is running!*
- *Wait until the motor has cooled down before opening.*

- 1) Open the engine hood.
- 2) The unlocking screw is to the right above the radiator. Unscrew this. ► The radiator cap opens. The filler opening of the radiator is located under the radiator cap.
- 3) Open the radiator cap.
- 4) Completely fill the radiator with coolant (Observe mixing ratio antifreeze/water ► see page 20 Subsection 1.2.3 Operating fluids).
- 5) Close radiator cap.
- 6) Close radiator hatch.

#### 5.2.4 Checking the contamination degree of the air filter

The air filter is located at the rear end of the front car of the machine. The engine hood must be opened, in order to access the air filter. The removable lid of the air filter is accessible on the left side of the machine.



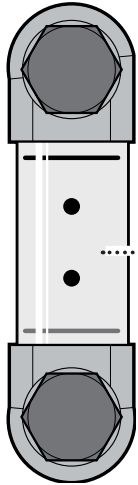
- 1) Open the engine hood.
- 2) Loosen fastening clamps on the air filter cover.
- 3) Remove air filter and check for the degree of pollution. Clean dirty air filters.
- 5) Exchange the air filter against a new one in the case of extreme contamination.



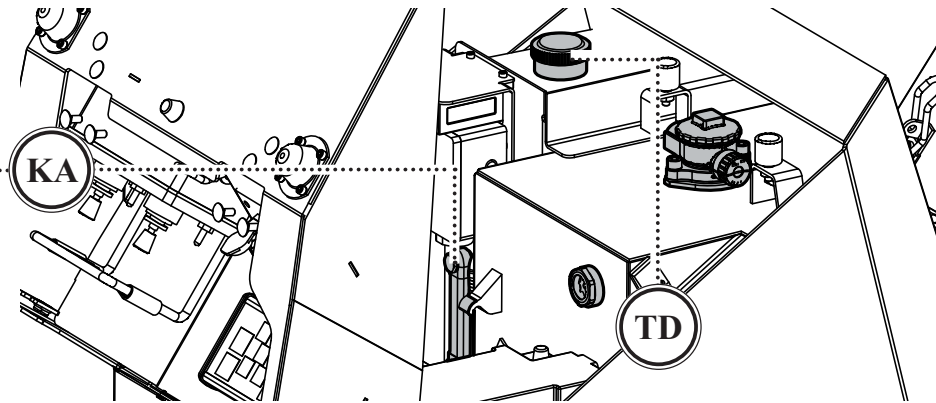
#### NOTE

**Be careful not to damage the air filter by inappropriate cleaning!  
Damaged air filters can damage the engine.  
Do not clean air filters with compressed air, do not wash, only tap!**

5.2.5 Checking fuel level / Tanking fuel



**KA** The sight glass for the examination of the fuel level is located under the operating panel.



The operating panel must be folded back, in order to refuel.

**Fuelling procedure:**

- 1) Open the tank lid **TD**.
- 2) Put the tank lid cap with the top downwards on a clean surface. ► This prevents dirt particles accumulating on the bottom of the tank lid cap and thus getting into the fuel tank.



**WARNING**

**Fire danger!**

**Fuels are extremely flammable.**

- Do not smoke during refuelling.
- Keep naked flames and sparks away.
- Never operate the machine with loose or missing fuel tank cap.

- 3) Refuel the machine with Diesel fuel. ► Use a funnel. It prevents fuel overflowing. ► Use a filter. It prevents dirt particles getting into the fuel tank when refuelling.
- 4) Close the tank lid after the fuelling procedure.

5.2.6 Adjusting address to transmit transmitter signals



**ENVIRONMENT**

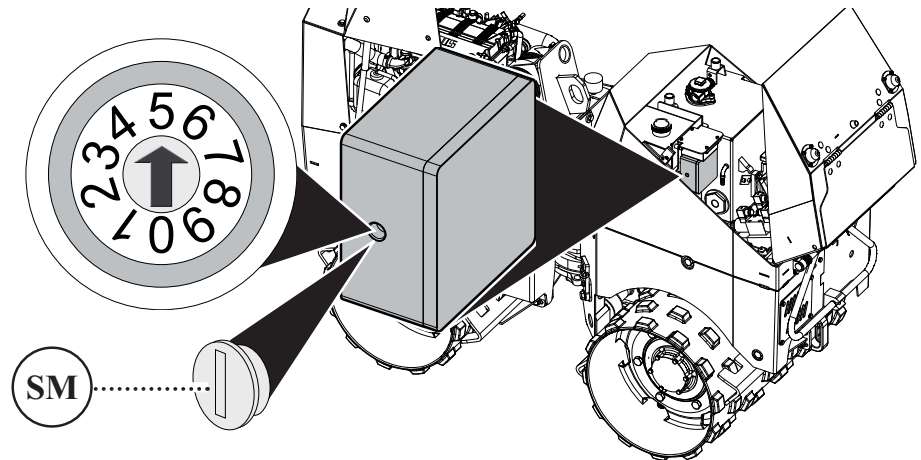
**Leaking fuel pollutes the soil!**

- Place an intact container of sufficient size under the tank filler neck before refuelling.
- Do not spill fuel.
- Collect leaking fuel, do not let it seep into the ground.

(only for machines with infrared control)

**Setting the transmitter address on the machine controller:**

- 1) Fold the operating panel back.

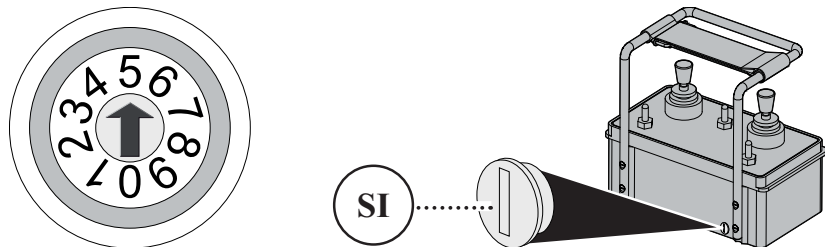



- 2) Remove the plug (SM) from the machine controller with a screwdriver entfernen.
- 3) Set in the required address by turning the arrow with a screwdriver.

**Setting the transmitter address on the infrared control:**

Remove the plug „SI“ from the infrared control with a screwdriver entfernen.

- Set the same address as on the machine controller by turning the arrow with a screwdriver.



	<p><b>NOTE</b></p>
<p><i>The addresses at the transmitter and receiver must correspond. Transmitter and receiver are factory set to address 5.</i></p>	

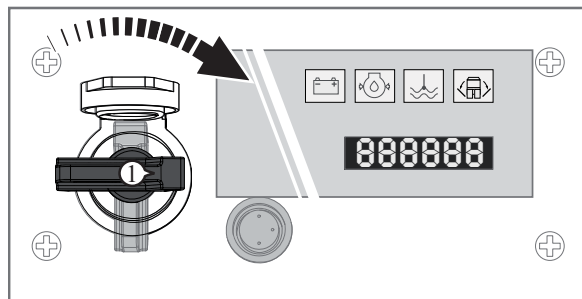


### 5.3 Starting the machine

The machine only reacts to the control mode with which your engine was started. The machine only reacts to control impulses of the manual control, if the engine has been started with the manual control. The machine only reacts to control impulses of the infrared control, if the engine has been started with the infrared control. An exception is starting and shutting down the machine. This is also always possible with the ignition key. The first used control mode has priority, if the machine has been started at the cockpit with the ignition key.

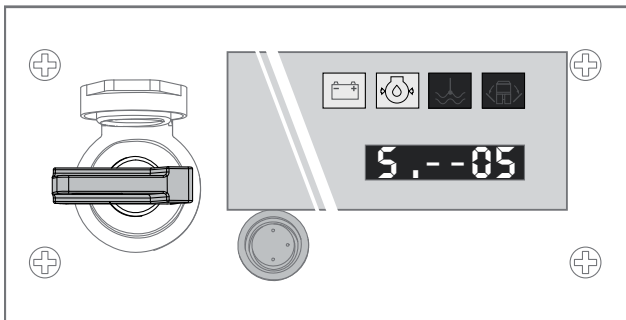
#### 5.3.1 Switching ignition on

The display elements are tested after switching the ignition on. The number of 888888 as well as the warning lights illustrated here light up. The cockpit should be exchanged, if a number is not complete. Troubleshooting is necessary, if one of the warning lights does not light up. If the cause is a defective warning light, this only affects machine safety in as far as a defect will not be indicated by the machine controller and therefore not immediately recognised by the operator.

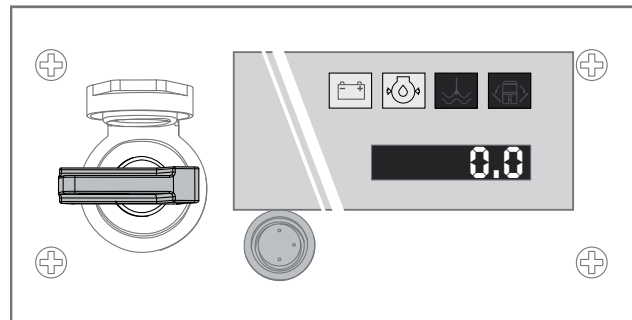


Display test

Code S is displayed after about 1 second. - - 05 and the operating hour meter alternating on the display. The machine can now be started from the ignition lock, manual control, or infrared control.



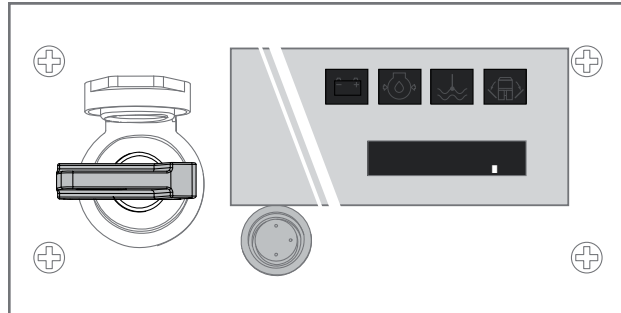
Code S. - -05



Operating hour meter

**5.3.2 Stand-by mode**

The machine reverts to the standby mode, if it is not started within 30 seconds. The machine can nevertheless be started in this state with one of the control modes or with the ignition key.



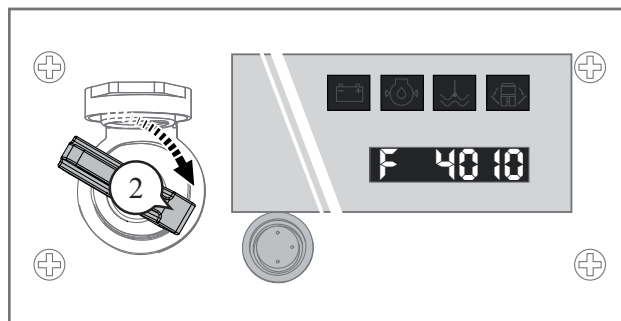
Stand-by : No display active. Only the decimal point flashes.

	NOTE
	<p><b>A low current always flows in the "Standby" mode. The ignition lock serves as battery disconnection switch.</b></p> <p>► <b>In the case of longer work breaks switch ignition off, in order to avoid battery discharge..</b></p>

**5.3.3 Starting the machine at the ignition lock**

Before starting, put the control levers and/or control keys for the vibration function in the neutral position.

- Turn the ignition key to position "2". The following code is displayed: „F 4010". The LEDs for generator and oil pressure drop extinguish. The starter is active, as long as the ignition key is at the "Ignition position 2".



Starting procedure



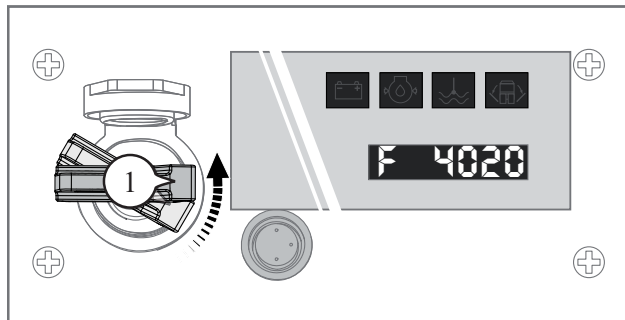
**NOTE**

The ignition start switch has a starter anti-repeat function. The starter is not activated anymore, if the engine is running.

- ▶ At the most 15 seconds continuous starting and in between breaks of approx. 1 minute.
- ▶ Identify and repair cause of malfunction (malfunction table), if the engine should not start.

Code „F 4020” lights up: The motor has started.

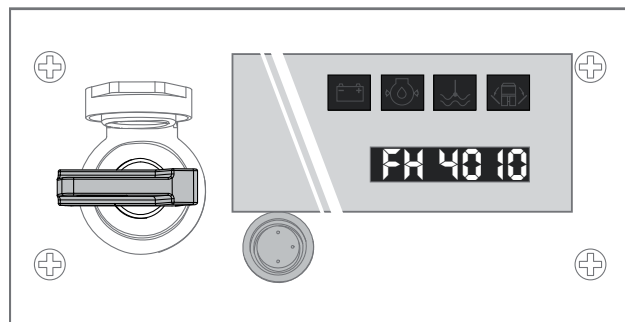
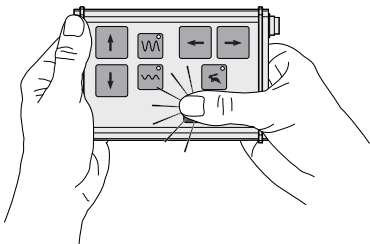
- ▶ Release ignition key. The ignition key returns automatically to „Ignition position 1”.



After engine start-up

**5.3.4 Starting the machine with the manual control device**

- ▶ Press the "Start" key on the manual control. The following code is displayed: „FH 4010”. The LEDs for generator and oil pressure drop extinguish. The starter is active, as long as the "Start" key is pressed.



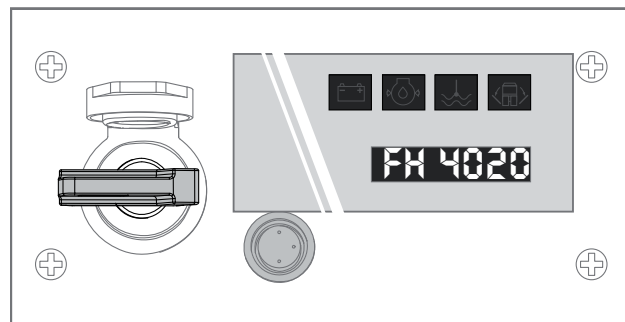
**NOTE**

*The ignition start switch has a starter anti-repeat function. The starter is not activated anymore, if the engine is running.*

- ▶ *At the most 15 seconds continuous starting and in between breaks of approx. 1 minute.*
- ▶ *Identify and repair cause of malfunction (malfunction table), if the engine should not start.*

Code „FH 4020” lights up: The motor has started.

- ▶ Release „Start” key. Code: Code „F H-00” lights up: The machine waits for manual control commands and is ready for use.



### 5.3.5 Starting the machine with the infrared control.

**NOTE**

*The infrared control does not recognize the neutral position, if the toggle switch is moved directly from the switch position "Stop" to the switch position "Start". The engine is not started.*

- ▶ *Always first move the toggle switch to the to neutral position*

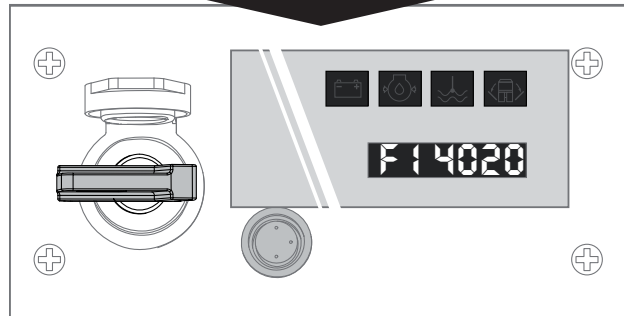
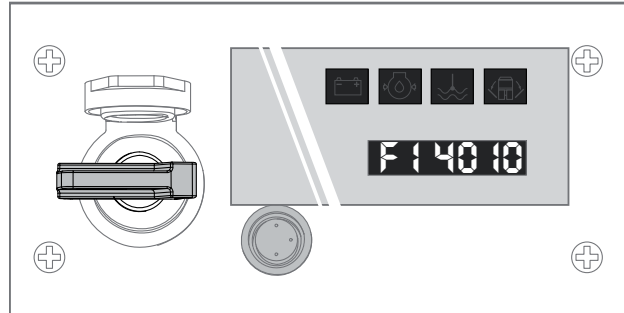
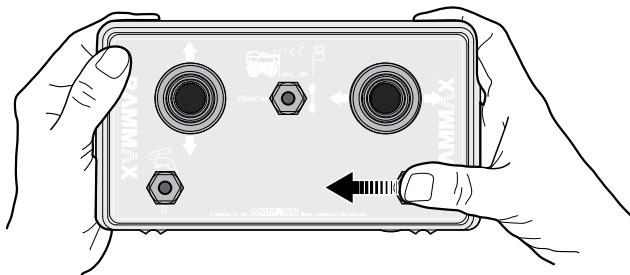
- ▶ Push the "Start switch" on the infrared control to the neutral position.
- ▶ Move the "Start switch" on the "Start" position and hold down. The following code is displayed: „F I 4010". The LEDs for generator and oil pressure drop extinguish. The starter is active, as long as the "Start switch" is pressed.



**NOTE**

The ignition start switch has a starter anti-repeat function. The starter is not activated anymore, if the engine is running.

- ▶ At the most 15 seconds continuous starting and in between breaks of approx. 1 minute.
- ▶ Identify and repair cause of malfunction (malfunction table), if the engine should not start.

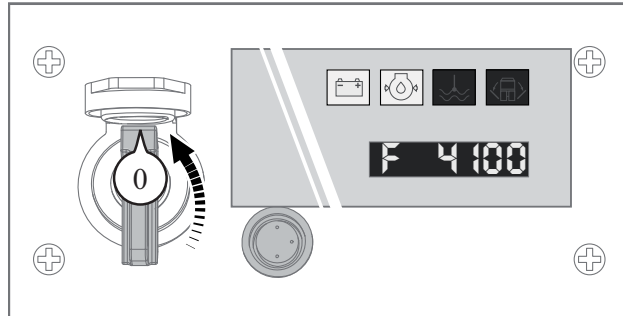


The following code is displayed after starting: „F I-00“. The machine waits for infrared control commands and is ready for use.

## 5.4 Switching machine off

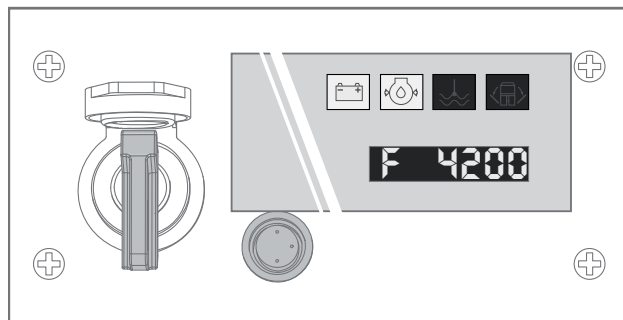
### 5.4.1 Switching the machine off at the ignition lock

- ▶ Turn the ignition key to position "0". The following code is displayed: „F 4100". The LEDs for generator and oil pressure drop are active. The stop procedure is initiated.

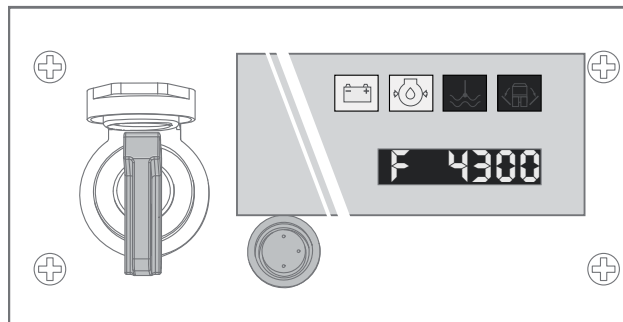


Stop procedure

- ▶ Code „F 4200" is displayed, if no further signal is received from the generator and from the oil pressure sensor.

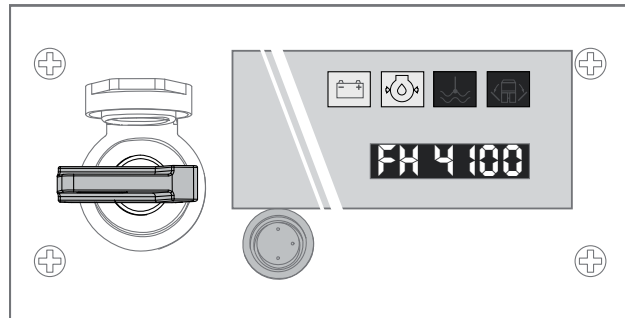
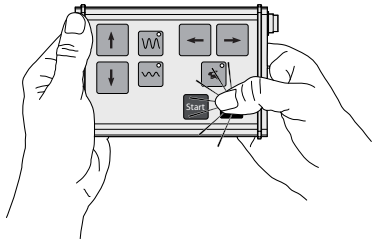


- ▶ End of the stop procedure. „F 4300" is displayed. The operating hour meter is saved. The machine shuts down. Restarting is only possible after the end of this stop sequence. Remove the key after finishing work and secure the machine against unauthorized use.



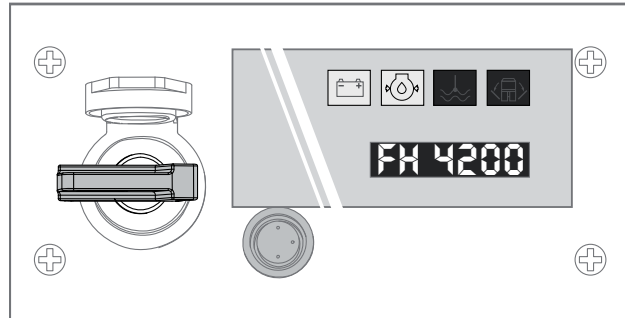
**5.4.2 Switching the machine off with the manual control device**

- ▶ Press the "Stop" key on the manual control.
- ▶ The following code is displayed: „FH 4100”. The LEDs for generator and oil pressure drop are active. The stop procedure is initiated.

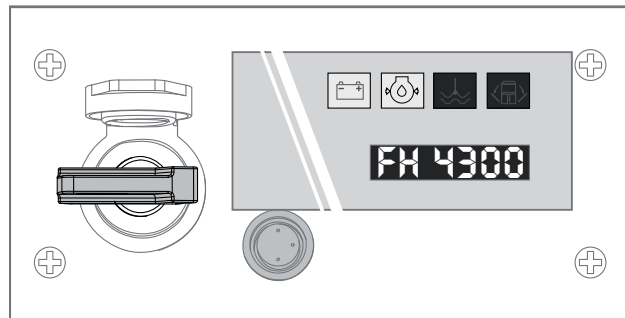


*Stop procedure*

- ▶ Code „FH 4200” is displayed, if no further signal is received from the generator and from the oil pressure sensor.

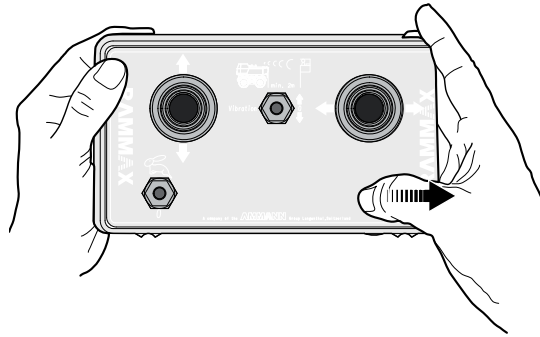


- ▶ End of the stop procedure. „FH 4300” is displayed. The operating hour meter is secured. The machine shuts down. Restarting is only possible after the end of this stop sequence. Remove the key after finishing work and secure the machine against unauthorized use.



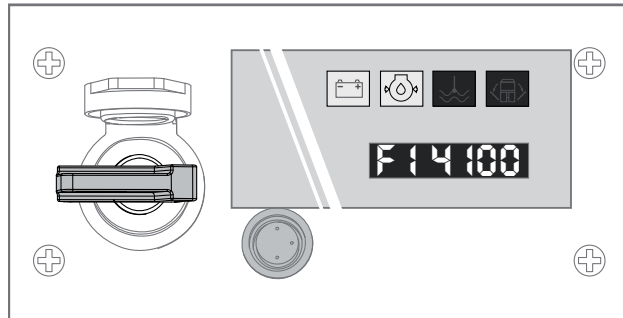
5.4.3 Switching the machine off with the infrared control device

- ▶ Move the toggle switch "Start-Stop" on the infrared control from the switch position "Neutral" to the right to switch position "Stop".



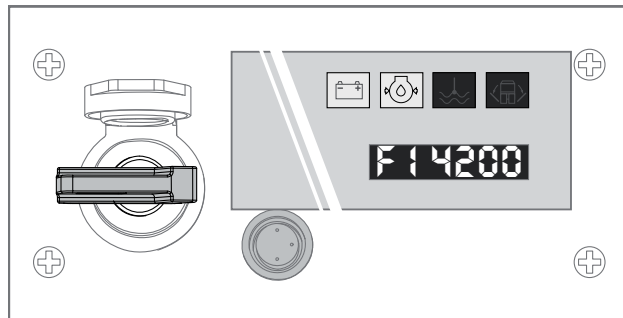
	<p><b>CAUTION</b></p>
<p>The transmitter is ready for use as long as the toggle switch "Start-Stop" is in the switch position "Neutral".</p> <ul style="list-style-type: none"> <li>▶ Always turn the transmitter off by switching the toggle switch to "Stop" during breaks and after finishing work.</li> </ul>	

- ▶ The following code is displayed: „F I 4100“. The LEDs for generator and oil pressure drop are active. The stop procedure is initiated.



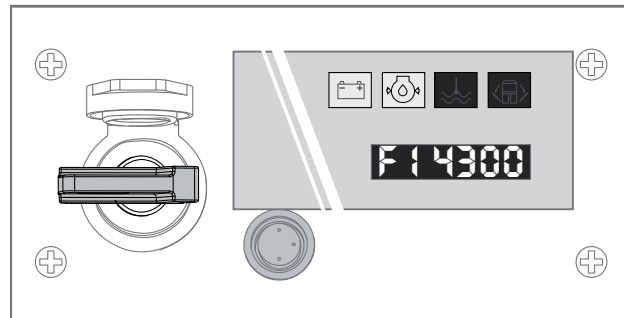
Stop procedure

- ▶ Code „F I 4200“ is displayed, if no further signal is received from the generator and from the oil pressure sensor.





- End of the stop procedure. „F I 4300” is displayed. The operating hour meter is secured. The machine shuts down. Restarting is only possible after the end of this stop sequence.



## 6. Using the machine

### 6.1 Safety instructions



#### 6.1.1 General

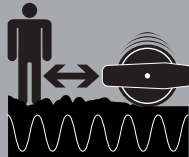
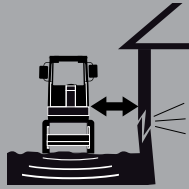
- Only qualified and appropriately trained specialised personnel, with a minimum age of 18 years, may operate the machine.
- Persons acting under the influence of drugs, medicines or alcohol may not operate the machine.
- If you should not have already made yourself familiar with the control and display elements of this machine, you must read Section 4. *Display and control elements* and thereby make yourself familiar with the functions. All display and control elements are described there in detail.
- For operating the machine, the specifications in the Subsection 1.1.3 *Areas of application* and in Section 2.2 *Intended use/Product safety* must be observed.
- Desist from any method of operation which could pose a safety hazard or impair the static stability of the machine.
- Never travel on slopes transversely, but always directly upwards or downwards.
- Damp and loose substrates substantially reduce the machine's grip on sloping surfaces and inclines. When driving on inclines and sloping surfaces adjust the speed of the machine to the terrain.
- Soil condition and weather influences impair the climbing power of the machine. Never drive up or down slopes steeper than the climbing ability of the machine.
- Keep your distance from edges and embankments.
- When leaving the machine it must always be safeguarded against unintentional rolling away or unauthorised use. Always attach chock blocks when turning the machine off on slopes.
- Check before driving, whether persons or items are in the driving range.
- No one may be present in the danger area of the machine.
- Always give way to loaded transport vehicles.
- The operator must always keep visual contact to the machine when operating it with the infrared control.

**6.1.2 Before operating the machine**

Make sure that:

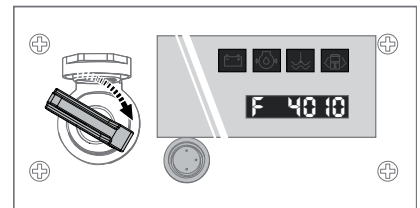
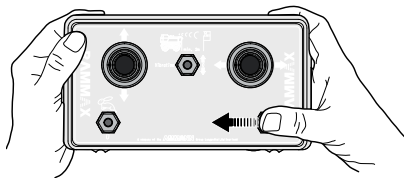
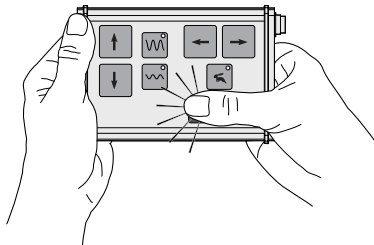
- The fill levels of the operating fluids, hydraulic oil, coolant and engine oil are at a sufficient level.
- All safety equipment is working.
- All control elements and display elements are working.
- No persons or objects are in the danger zone.
- The transport protection has been released.

**6.1.3 Using the vibration function**

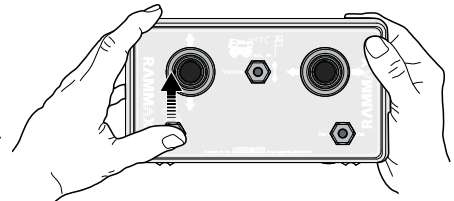
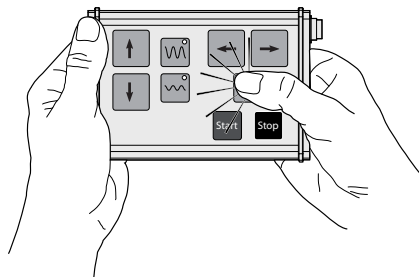
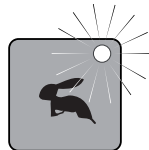


- Compaction work in direct proximity of buildings can result in damage to buildings or to lines installed in the ground. Check the effects on buildings and lines. If necessary, increase the distance between the compaction device and endangered buildings or stop the compaction work.
- The vibration function of the machine causes the soil in the area of the drum to vibrate considerably. Persons should not be exposed to these vibrations. Loose material, such as stones and earth lumps can be hurled through the air. Persons, who are in the vicinity of the drum can be hit and injured by these flying around objects. Therefore observe a sufficient safety distance to the machine, in particular when the vibration function is active.

1) Start the machine with the required control mode or directly at the cockpit with the ignition key.

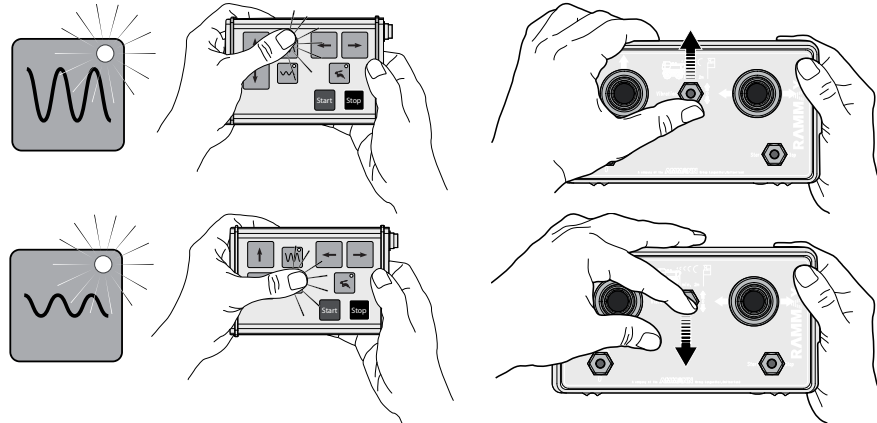


2) Drive the machine onto the area to be compacted. Use the fast gear to overcome larger distances, if the terrain enables this.

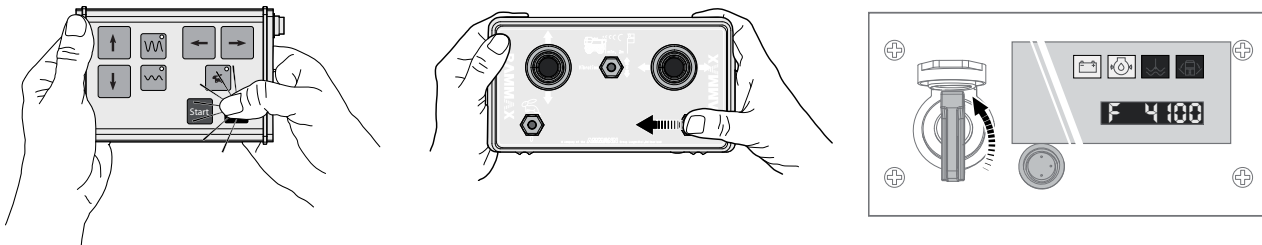


3) Switch the fast gear off when you have arrived at the area to be compacted.

- 3) Depending upon required compaction force, switch the large or small vibration on.



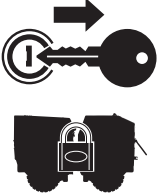

- 4) Drive over the area to be compacted several times, until it is completely compacted.
- 5) After completing the compaction work drive the machine to a level area where it is not an obstacle.
- 6) Stop the engine. If the machine is parked on a slope, safeguard it with chock blocks.



	<b>CAUTION</b>
	<p>The transmitter is ready for use as long as the toggle switch "Start-Stop" is in the switch position "Neutral".</p> <ul style="list-style-type: none"><li>▶ Always turn the transmitter off by switching the toggle switch to "Stop" during breaks and after finishing work.</li></ul>

## 6.2 Parking the machine

If possible, park the machine on a level ground. Parked machines which could represent an obstruction must be safeguarded by clearly identifiable measures.

	 <b>WARNING</b>
<p><b><i>Safeguard the machine before leaving against use by unauthorised persons.</i></b></p> <ul style="list-style-type: none"><li>▶ <b><i>Withdraw ignition key!</i></b></li><li>▶ <b><i>Lock doors and flaps!</i></b></li><li>▶ <b><i>Always attach chock blocks when turning the machine off on slopes.</i></b></li></ul>	

## 7. Loading and transporting the machine

### 7.1 Safety instructions



#### 7.1.1 General

- Only qualified and appropriately trained specialised personnel, with a minimum age of 18 years, may participate in loading the machine.
- Persons acting under the influence of drugs, medicines or alcohol may not be involved in loading the machine.
- The maximum total weight of the transport vehicle may not be exceeded.
- The transport lock must be applied before each transport and removed after the transport.
- Shackles and chock blocks must be always used for fastening the machine.
- The shackles may be attached to the intended transport eyebolts.
- The machine must be fastened in such a way, that it is secured against tilting, slipping or rolling off, and that no one is endangered by the machine.

#### 7.1.2 Loading the machine with a loading ramp



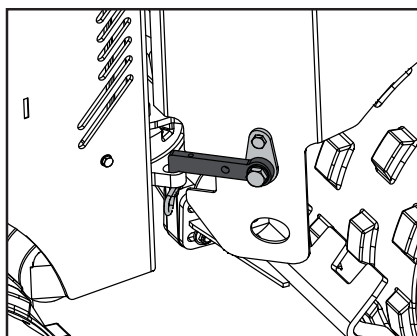
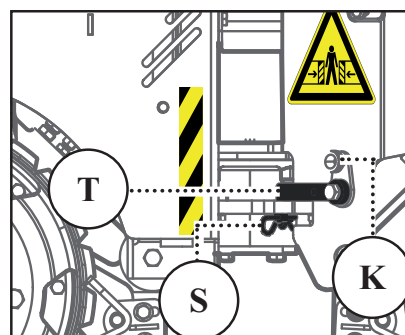
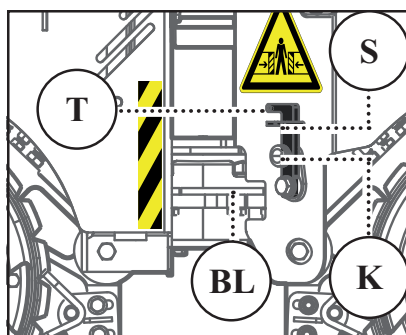
- If you should not have already made yourself familiar with the control and display elements of this machine, you must read Section 4. *Display and control elements* and thereby make yourself familiar with the functions. All display and control elements are described there in detail.
- Desist from any method of operation which could pose a safety hazard or impair the static stability of the machine.
- Check before driving, whether persons or items are in the driving range.
- It is prohibited that persons stay in the vicinity of the articulation, when the engine is running.
- It is prohibited that persons stay in the area of the loading ramps during the loading procedure.
- When leaving the workplace, the machine must always be safeguarded against unintentional rolling away or unauthorised use.
- Loading ramps must be always free of dirt and ice, since they reduce the adhesion of the drum on the loading ramps. Moisture can also reduce grip on the loading ramp.
- Only use loading ramps with sufficient carrying capacity, stability and width. The loading ramp inclination may not be steeper, than the maximum climbing ability of the machine.
- The speed of the machine must be adapted accordingly when driving on the loading ramp.
- There is lethal danger for persons, if they are in the area of the machine when supervising the machine and when loading.

#### 7.1.3 Loading the machine with hoisting gear

- The transport protection must be applied before loading with hoisting gear, since front and rear cars of the machine could otherwise come into contact in the middle.
- Ensure that the carrying capacity of the hoisting gear is sufficient for the weight of the machine.
- Only hoisting gear with a carrying capacity of at least 2000 kg may be used to load the machine.
- The machine may only be lifted at the intended transport eyebolts.
- Ensure that there are no loose items on the machine.
- There is a lethal risk for persons, if they step or stand under suspended loads.
- When raised, the machine must not be allowed to swing wildly.

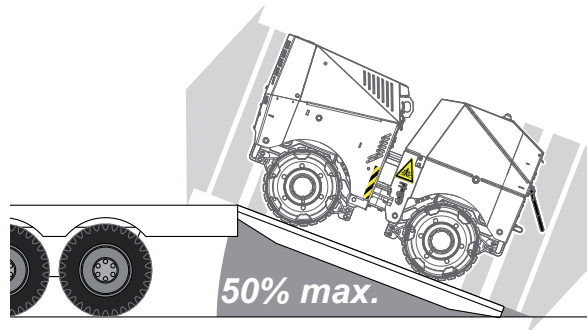
**7.2 Using the transport protection**

- 1) Straighten the articulated steering of the machine. ► The transport lock cannot be applied, if the machine has not been aligned straight.
- 2) Loosen **(K)** knurled screw.
- 3) Withdraw **(S)** split pin
- 4) **(T)** Fold out transport protection.
- 5) Secure transport protection **(T)** and bracket **(BL)** with the previously loosened split pin **(S)**.
- 5) Screw screw **(K)** for storage back into the thread.



**7.3. Loading the machine with ramps**

The machine can be loaded by driving over a suitable ramp. Do not thereby exceed the maximum climbing ability of the machine.



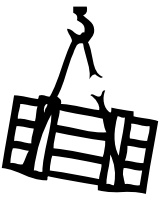
**7.4 Loading the machine with hoisting gear**

The transport protection must be applied before loading with hoisting gear. Only hoisting gear with a carrying capacity of at least 2000 kg may be used to load the machine. The machine may only be lifted at the intended transport eyebolts.

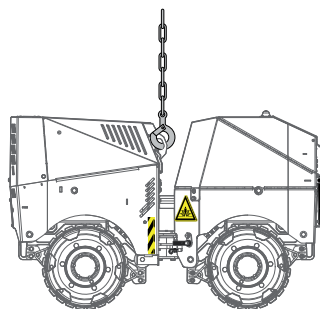
- 1) Attach transport protection.
- 2) Apply the hoisting gear to the transport eyebolts of the machine.
- 3) Hook in the crane hook.
- 4) Lift the machine.



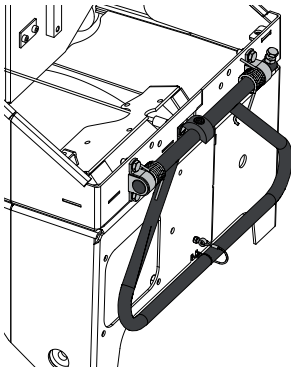
*Rammax GmbH does not assume responsibility for damages, which result from the use of hoisting gear, which does not correspond to the specified requirements.*

	<p><b>Danger</b></p>
<p><b>Death by crushing!</b>  <b>Items can come loose and falls down!</b>  <b>Do not walk or stand under suspended loads. Do not leave any loose items on the machine.</b></p>	

- 5) Loaded and setting the machine down.

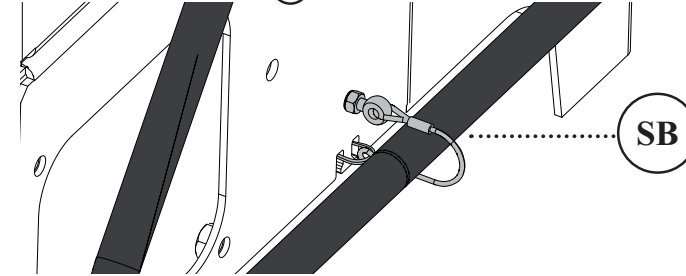


**7.5 Securing the machine for transport**



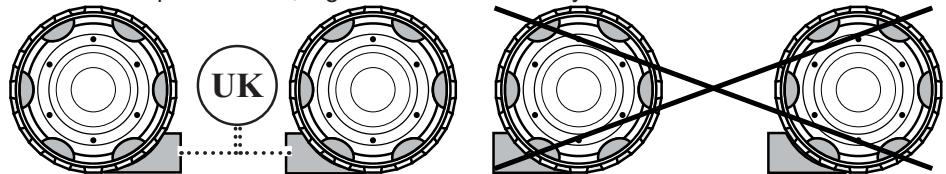
Transport position

- 1) Check whether the transport protection is applied. ► If not, apply the transport protection.
- 2) Check whether the shutdown yoke is in the transport position (activated). ► If the shutdown yoke is not in the transport position, then press it downwards to the chassis of the machine and secure it with the retaining band (SB).
- 3) Put the chock blocks (UK) on both sides of the machine centrally under the drums.



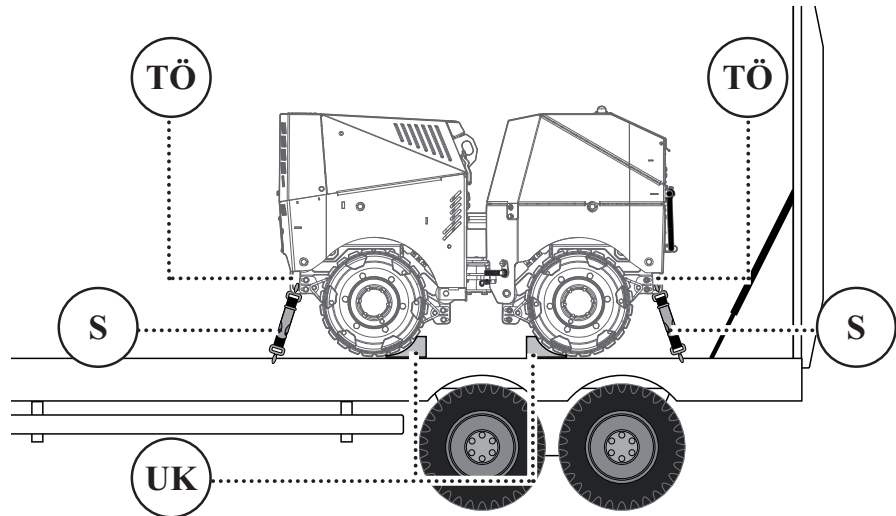
► The chock blocks must be aligned opposite to each other, since the machine could otherwise move in one direction.

- 4) Hook the shackles into the transport (S) eyebolts (TÖ) of the machine and eyebolts of the transport vehicle; tighten the machine symmetrical crosswise on the



transport platform.

- 5) Check the load safeguard equipment again before transport.
- 6) Remove all loose items from the load and transport platform. ► Loose items can



fall off the vehicle when driving and endanger others.



## 8. Maintaining the machine

### 8.1 Safety instructions

#### 8.1.1 General



- Maintenance work may only be performed by suitably qualified and trained personnel.
- Keep unauthorised persons away from the machine.
- Never carry out maintenance work on a moving machine or with the engine running.
- Turn the engine off and withdraw the ignition key before carrying out maintenance work.
- Wherever possible, park the machine on a firm and even surface.
- Pull out the key of the ignition start switch.
- Secure articulation with the transport protection
- The machine is operated with Diesel fuel. • When carrying out work on the fuel system, never smoke or expose to a naked flame. Do not carry out welding work on the fuel tank or in the vicinity of unprotected parts of the fuel system.

#### 8.1.2 Refuelling fuel



- Fuels are extremely flammable. Do not smoke during refuelling. Keep naked flames and sparks away. Never operate the machine with loose or missing fuel tank cap.
- Only refuel when the engine is switched off.
- Fuel vapours are very poisonous. Only refuel outdoors or in well ventilated rooms. Do not inhale fuel vapours.
- Always use a funnel for refilling fuel, so that no fuel can overflow. Filter the fuel, so that no dirt or dust gets into the tank.
- Only use Diesel fuels. The engine can be damaged, if other fuels are used.
- Only use fuels with a cetane number of less than 45, since starting problems could occur otherwise.
- Do not use dirty Diesel fuel or Diesel fuel mixed with water, since this could damage the engine.
- Dispose contaminated fuels correctly.

#### 8.1.3 Working on the engine

Drain the engine oil at operating temperature – Danger of scalding!

Wipe overflowing oil off, collect leaking oil, and dispose in an environmentally acceptable manner.

Collect used filters and other materials contaminated with oil in a separate, specially marked container and dispose in an environmentally friendly manner.

#### 8.1.4 Working on electrical system components



- Disconnect the battery before working on electrical system components and cover with insulating materials.
- Never insert fuses with a higher amperage use or repair fuses. Fire danger!



Work on the battery

- When carrying out work at the battery, never smoke or expose to a naked flame.
- Do not let acid get on to hands or clothes. In the case of injuries by acid rinse with clear water and consult a physician.
- Never place any tools on the battery.
- Dispose of old batteries in compliance with regulations.

**8.1.5 Working on the fuel system**

- No naked flames, no smoking, do not spill fuel.
- Collect leaking fuel, do not allow to drain into the soil and dispose in an environment-friendly manner.

**8.1.6 Cleaning work**



- Never carry out cleaning work with the engine running.
- Never use petrol or other easily flammable materials for cleaning.
- Cover all electrical components and the insulating material when cleaning with the steam cleaner respectively do not expose to the direct water or steam jet.
- Do not direct the cleaning jet into the silencer.

**8.1.7 After completing maintenance work**

- All protective devices must be replaced after cleaning and maintenance work.
- Carry out function checks.

**8.1.8 Repair**

- Attach a warning sign to the defective machine.
- Only qualified and assigned persons may carry out repair work.

**8.1.9 Exchanging drums**

- Only use hoisting gear with appropriate carrying capacity!
- Observe dead weight of the drum!

**8.1.10 Working on the hydraulic system**



- Only persons with special hydraulics knowledge and experience may work on hydraulic equipment.
- Depressurise the hydraulic system before working on it.
  - Hydraulic oil escaping under high-pressure can penetrate the skin and cause severe injuries.
  - Immediately consult a physician in the case of injuries caused by oil escaping under high-pressure, since serious infections can otherwise result.
- When carrying out adjusting operations on the hydraulic system do not stand in front or behind the drum.
- Do not misadjust the relieve pressure valves.
- Drain the hydraulic oil at operating temperature
  - Risk of scalding!
  - Collect escaping hydraulic oil and dispose in an environmentally compatible manner.
  - Never start the engine, if the hydraulic oil has been drained.

- Check the tightness of all connections and screw connections after accomplishing any type of work (on a pressure-free system!!).
- Hydraulic lines may not be swapped.
- Hydraulic lines must be visually checked regularly.
- Immediate replacement of the hydraulic hoses is necessary in the following cases:
  - Damages to the outer layer up to the inset. (e.g. chafing, cuts).
  - Embrittlement of the outer layer (cracked formation on the line material).
  - Deformation in pressureless or pressurised condition which does not correspond with the original shape of the hydraulic line.
  - Deformation on bending, e.g. crushing points, kinks, separation of plies, formation of blisters.
  - Leaking parts.
  - Incorrectly executed installation.
  - Migration of the hydraulic line from the fitting.
  - Corrosion of the fitting, which reduces function and stability.
  - Damage to or deformation of the fitting, which reduces the function and stability or the connection line/line.

*Only original RAMMAX spare hydraulic line lines offer the security of using the correct line type (pressure stage) in the right situation.*

**8.2 Maintenance plan**

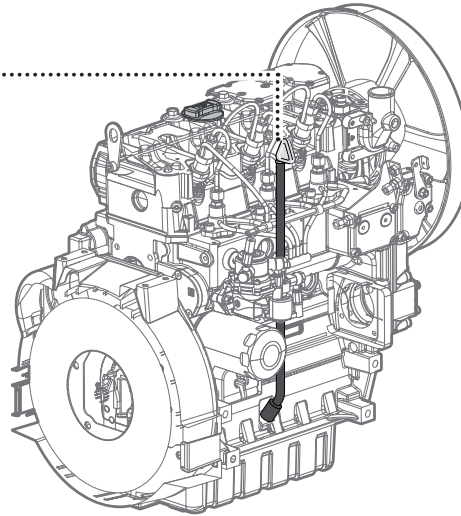
No.:	Description:	Remarks:	Page:
<b>Every day</b>			
9.8	-Check engine oil level	- Observe gauge marking	82
9.10	- Check machine for external damages - Check hydraulic oil level	- Visual inspection - Oil level eye	85
9.4	- Check fuel level	- Fuel gauge	78
9.13	- Check cooling water level		89
9.7	- Check air filter		81
	- Diesel engine see operating instructions Lombardini LDW 1003	(Annex)	
<b>After 25 hours of operation</b>			
	- Check all bolts and screws for tightness	Tightening torques	
	- Lubricate all lubrication nipples		
9.5	- Check the fuel filter		79
	- Diesel engine see operating instructions Lombardini LDW 1003	(Annex)	
<b>After 75 hours of operation</b>			
9.12	- Exchange the combination filters		87
9.17	- Service the battery	Grease the terminals	93
	- Attention: Engine oil Diesel engine (see operating instructions Lombardini LDW 1003)	(see Annex)	
<b>Every 100 operating hours</b>			
9.7	- Replace air filter cartridge (earlier, if necessary)		81
9.18	- Tighten screws on side panels and at the articulation.		94
<b>Every 200 operating hours</b>			
	- Check all bolts and screws for tightness	Tightening torques	96
9.5	- Exchange the fuel filter		79
	- Inspect all diesel lines for leaks		
<b>Every 500 operating hours</b>			
9.16	- Diesel engine see operating instructions Lombardini LDW 1003 - exchanging line filters	(see Annex)	80
<b>Every 1000 operating hours</b>			
9.11	- Change hydraulic oil (at least 1 x annually)		86
9.5	- Exchange the fuel filter		79
9.12	- Replace suction filter		87
<b>As required</b>			
9.19	- Adjusting stripper		94
	- Check all bolts and screws for tightness	Tightening torques	96
	- Engine preservation	see operating instructions Lombardini LDW 1003 (Appendix)	

### 8.3 Checking engine oil level



The dipstick (OS) is located on the right side of the engine underneath the cooling water tank. The engine has been filled in the factory with engine oil, viscosity class 15W40. If there is the need to change to a different viscosity class (e.g.: permanent extreme outdoor temperatures), the oil must be changed.

- 1) Park the machine on flat ground.



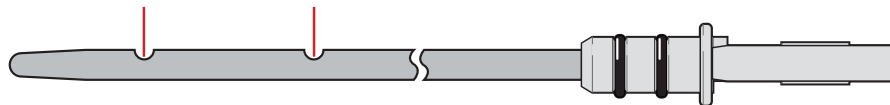
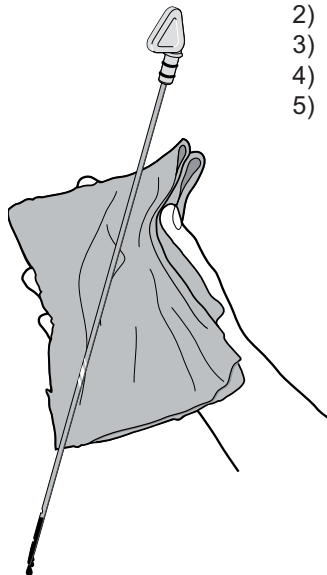
#### CAUTION

**Danger of burning!**

*The engine and its detachable parts are hot during and immediately after operation.*



► *Before touching the engine or the detachable parts first allow these to cool down.*


- 2) Pull the dipstick out.
- 3) Wipe the dipstick with a dry, fibre-free rag.
- 4) Insert the dipstick up to the stop in its fixture.
- 5) Pull the dipstick out again and read the oil level. ► The oil level should be between the two markings. More engine oil must be filled in, if the oil level is too low (only use engine oils with the same viscosity).



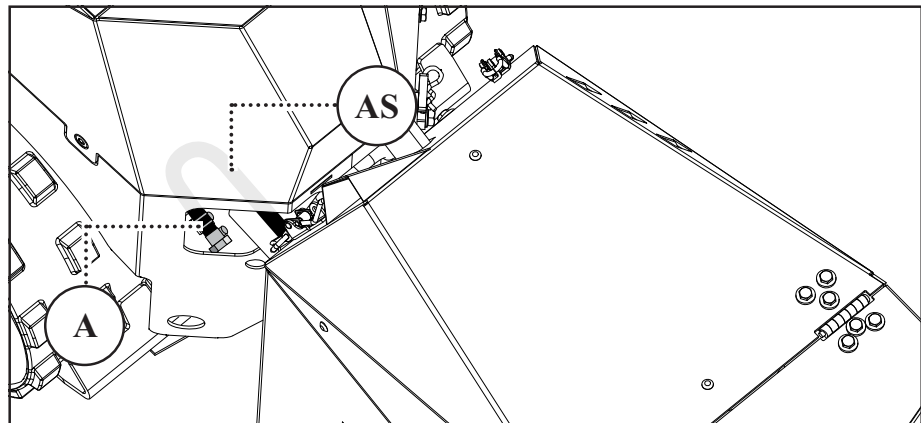
### 8.4 Exchanging engine oil

The engine oil must be exchanged after the first 50 working hours and thereafter every 75 working hours, at the latest after one year. The oil filter must also be exchanged when replacing the engine oil. Only original spare parts may be used, in order to maintain the functional capacity of the diesel engine.

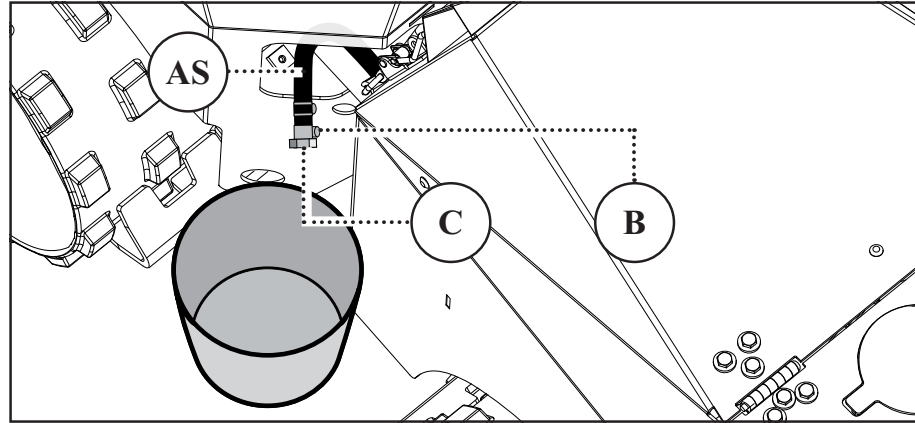
	 <b>WARNING</b>
	<p><b>Risk of scalding!</b>  <b>Hot engine oil can cause severely scald the skin at contact.</b>                  ► <b>Wear suitable protective clothing.</b></p>

	<b>NOTE</b>
	<p><b>Only drain engine oil from a warm engine.</b>  <b>Never start the engine without engine oil.</b></p>

- 1) Park the machine on flat ground.
- 2) Loosen retaining screw of the clip (A) on the oil drain line (AS).



- 3) Prepare container to collect the engine oil. ► The container must have a capacity of at least 4 litres and be undamaged.
- 4) Insert oil drain line into the prepared container.
- 5) Screw out (B) clip and plug (C) on the oil drain line carefully (AS).
- 6) Allow oil circuit to drain completely.



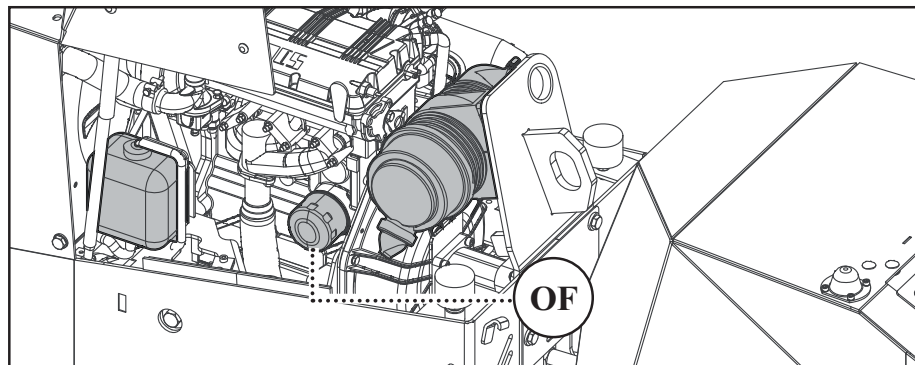
7) Unscrew (OF) oil filter.



## ENVIRONMENT

**Leaking lubricating oils pollute the soil!**

- ▶ Collect leaking engine oil and dispose together with the oil filter in an environmentally friendly manner!
- ▶ Do not spill engine oil.
- ▶ Collect leaking fuel, do not let it seep into the ground.

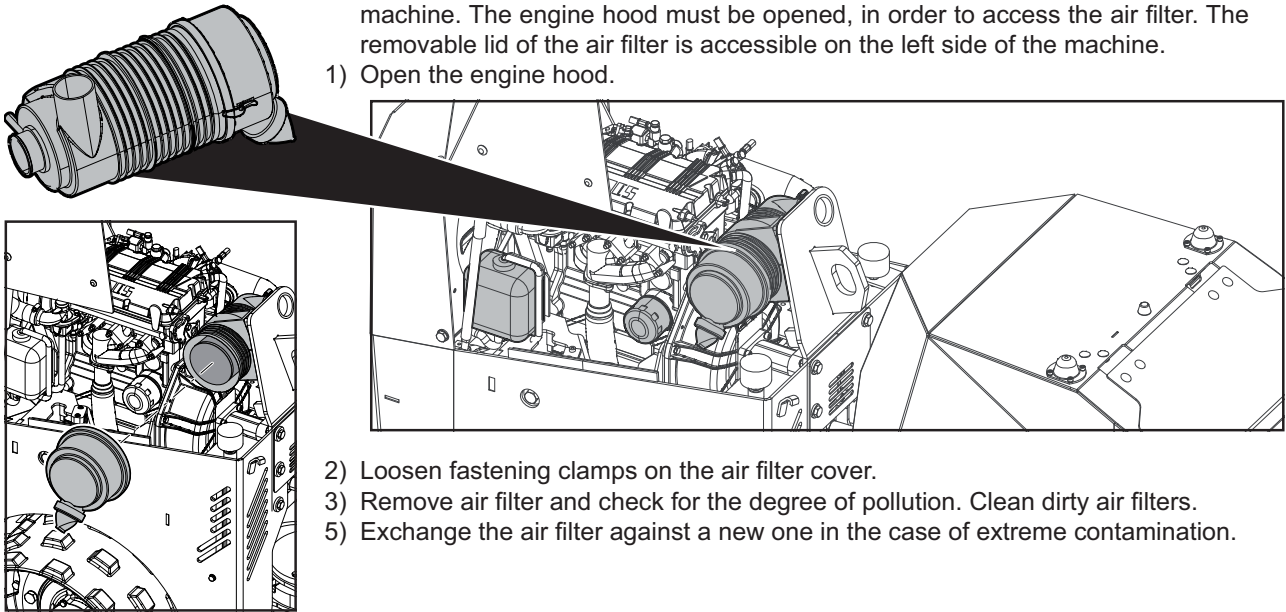


- 8) Clean thread with a fibre-free rag.
- 9) Screw new oil filter in and only tighten by hand.
- 10) Screw plug (C) onto the oil drain line again and secure with the (B) clip. Observe installation position of the line.
- 11) Fasten oil drain line (AS) with retaining clip (A).
- 12) Refill engine oil (pay attention to viscosity - see technical data)
- 13) Pull the dipstick out.
- 14) Wipe the dipstick with a dry, fibre-free rag.
- 15) Insert the dipstick up to the stop in its fixture.
- 16) Pull the dipstick out again and read the oil level. ▶ The oil level should be between the two markings. ▶ The oil level should be low (only use engine oils with the same viscosity).

### 8.5 Checking the contamination degree of the air filter

The air filter is located the rear end of the front car, near to the articulation of the machine. The engine hood must be opened, in order to access the air filter. The removable lid of the air filter is accessible on the left side of the machine.

- 1) Open the engine hood.



- 2) Loosen fastening clamps on the air filter cover.
- 3) Remove air filter and check for the degree of pollution. Clean dirty air filters.
- 5) Exchange the air filter against a new one in the case of extreme contamination.



#### NOTE

**Be careful not to damage the air filter by inappropriate cleaning!**  
**Damaged air filters can damage the engine.**  
**Do not clean air filters with compressed air, do not wash, only tap!**

### 8.6 Changing the fuel filter

The fuel system is self-priming. The fuel filter (DF) must be exchanged at least once annually or every 200 hours.

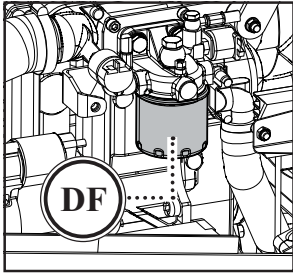


#### WARNING

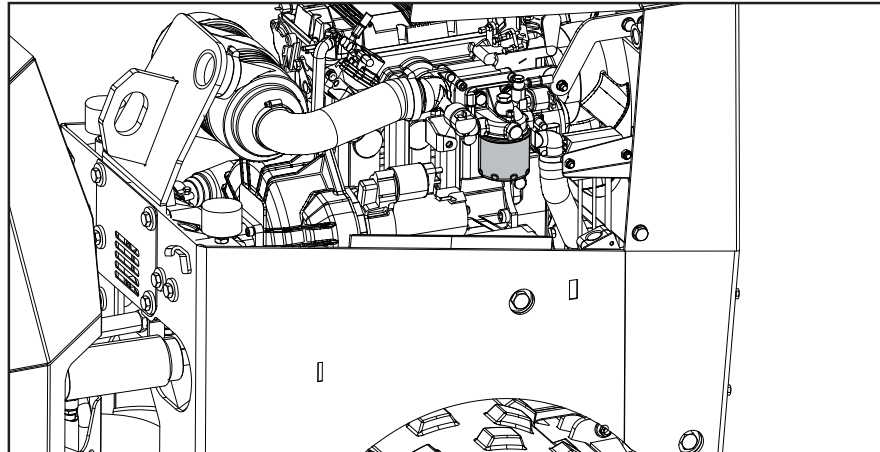
**Fire danger!**  
**Fuels are extremely flammable.**

- ▶ Do not smoke when working on the fuel system.
- ▶ Keep naked flames and sparks away.
- ▶ Do not weld on or in the proximity of the fuel system.





- 1) Loosen hexagonal bolt (S) on the filter holder and remove the fuel filter (DF).
- 2) (DF) Take off fuel hoses and insert new fuel filter. Exchange fuel hoses, which are leaking or porous.
- 3) (DF) Mount the fuel filter in reverse order and check for leaks.



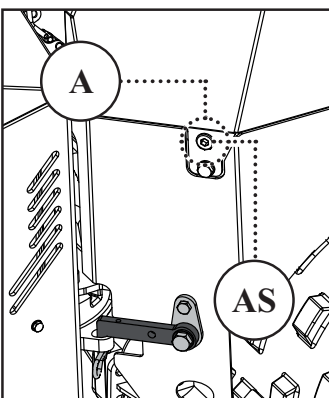
### 8.7 Emptying the fuel tank

The fuel can be drained from the fuel tank if necessary. The fuel tank is equipped with a drain hole (A) for this purpose. It is located on the right side of the machine above the transport protection.

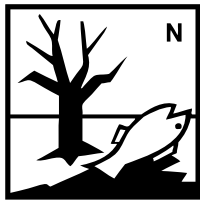


#### WARNING

- Fire danger!**  
**Fuels are extremely flammable.**
- ▶ Do not smoke when working on the fuel system.
  - ▶ Keep naked flames and sparks away.
  - ▶ Do not weld on or in the proximity of the fuel system.



- 1) Put an undamaged container with a capacity of at least 25 litres under the drain hole.
- 2) The drain plug must be removed to drain the fuel (AS) (Allen key width across flats 10).



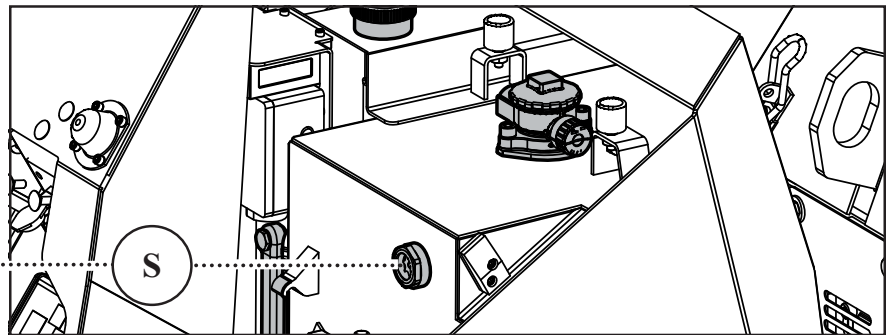
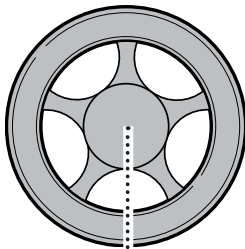
**ENVIRONMENT**

**Leaking fuel pollutes the soil!**

- ▶ Collect any leaking fuel and dispose of in an environmentally responsible manner together with the fuel filter!
- ▶ Do not spill fuel.
- ▶ Collect leaking fuel, do not let it seep into the ground.

**8.8 Checking hydraulic oil level**

The sight glass for the examination of the hydraulic oil level is located under the operating panel. The fill level should be within the sight glass.

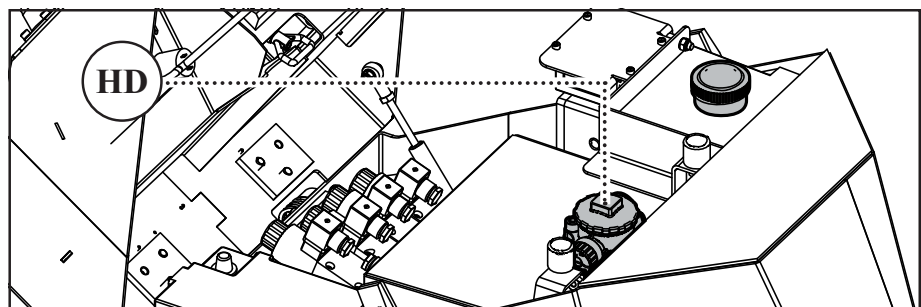


**NOTE**

**If it is determined during the daily oil level check that hydraulic oil is missing, immediately examine all aggregates, lines, and hoses for leaktightness and fill up missing hydraulic oil before beginning work.**

**Refilling hydraulic oil:**

- 1) Open **(HD)** cap.
- 2) Fill hydraulic oil to the fill level approximately in the centre of the sight glass.
- 3) Close **(HD)** cap.



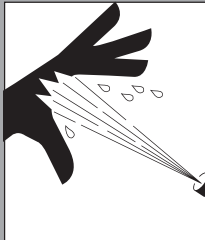
### 8.9 Hydraulic oil change/ Hydraulic filter change

Maintenance work on the hydraulic system is limited to filters and hydraulic tanks. All other aggregates do not require maintenance. The hydraulic pipework should however be examined in regular intervals for leaktightness. Do not spray hydraulic hoses with paint. The hydraulic oil should likewise be changed after larger repairs on the hydraulic lines. The intake filter (SF) should be replaced after each hydraulic oil change and every 1000 operating hours. The runback filter cartridge (RF) must be changed after 75 operating hours and regularly every 500 operating hours at least however once annually. Both filters must be renewed when the hydraulic oil is exchanged.



#### NOTE

**Never start the engine, if the hydraulic oil has been drained. The hydraulic oil lubricates the pumps. Without hydraulic oil there is no lubrication and the pumps are damaged.**



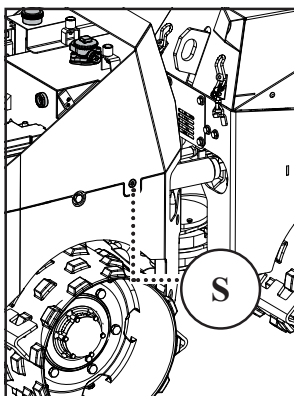
#### WARNING

**Danger of injury by pressurised hoses!**  
**The hydraulic system is subject to a high pressure during operation.**  
 ► **Depressurise the hydraulic system before loosening lines or components.**  
 ► **Never disconnect lines with a running diesel engine.**

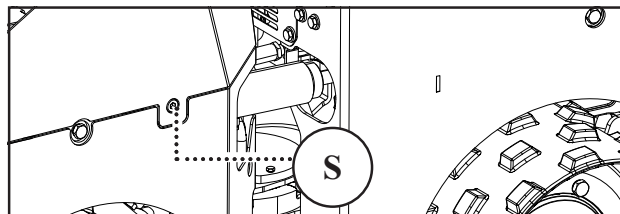


#### WARNING

**Risk of scalding!**  
**Hot hydraulic oil can severely scald the skin at contact.**  
 ► **Allow machine to cool down before draining the hydraulic oil.**



- 1) Park the machine on flat ground.
- 2) Depressurise the hydraulic system.
- 3) A threaded plug is located on the right outer side of the rear car (S) for draining the hydraulic oil. Put an undamaged container with a capacity of at least 45 litres under the drain hole.

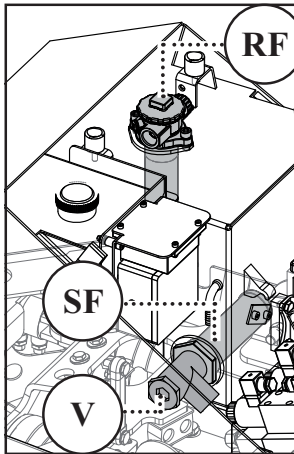




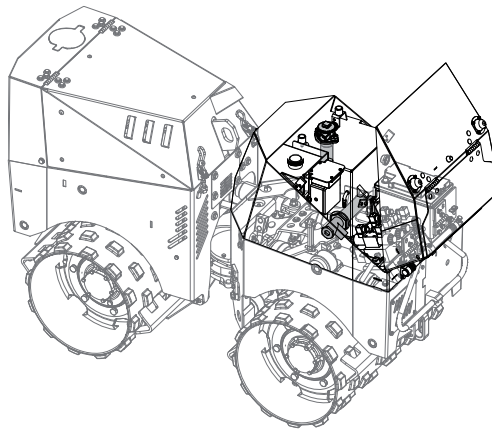
**ENVIRONMENT**

**Leaking hydraulic oils pollute the soil!**

- ▶ **Collect leaking hydraulic oil and dispose together with the hydraulic oil filter in an environmentally friendly manner!**
- ▶ **Do not spill hydraulic oil.**
- ▶ **Collect leaking hydraulic oil, do not let it seep into the ground.**



- 4) Unscrew the threaded plug (S) and drain hydraulic oil into the container.
- 5) Loosen the runback filter (RF) with a spanner wrench, wrench size 27 and remove.
- 6) Loosen the screws (V) with a spanner wrench, wrench size 46.
- 7) Loosen the intake filter element (SF) with a spanner wrench, wrench size 70 and remove.
- 8) Wash oil tank thoroughly. Clean sealing surfaces of the threaded plug (S) and chassis.
- 9) Mount threaded plug (S) with new gaskets.
- 10) Renew (SF) intake filter.
- 11) Fill in hydraulic oil through the opening of the runback intake filter until the fill level has reached the middle of the oil sight glass.
- 12) Renew (RF) runback filter.
- 13) Check the hydraulic system for leaktightness. ▶ Start engine and run it idle for a short time. ▶ Re-examine oil fill level at the oil fill level sight glass and refill again if necessary. Recommended types of oil see technical data.

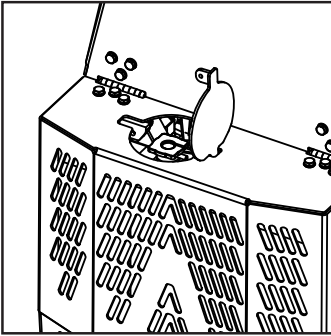


**ENVIRONMENT**

**Leaking hydraulic oils pollute the soil!**

- ▶ **Dispose hydraulic elements in an environmentally friendly manner.**

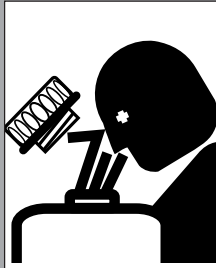
### 8.10 Checking cooling water level



Work may only be carried out on the cooling system when the diesel engine has cooled down. The machine must be parked on a level ground. The cooling water level is examined directly at the radiator. The compensating tank only serves as a buffer in order to take up water during expansion by the thermal effect and keep it in the cooling circuit. The engine hood and the radiator hatch must be open, in order to check the cooling water level.

The radiator must be completely filled. Coolant must be refilled, if the fill level is too low.

A radiator anti-freezing agent must be used in frost-endangered areas. The radiator has been filled in the factory with a radiator anti-freezing agent/water mixture. This mixture is adjusted to a temperature resistance of up to  $-30^{\circ}\text{C}$ .



#### DANGER

***Risk of scalding!***


***The engine extremely heats up the cooling water. The radiator is under pressure.***

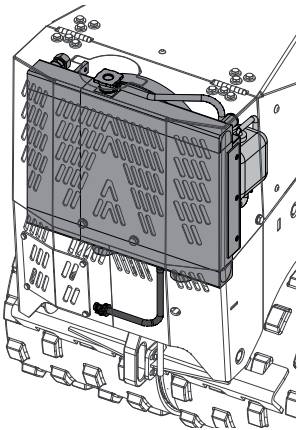
***When opening the radiator cap the pressure can escape suddenly and the hot cooling water can cause severe scalding!***

- ▶ ***Never open the cap of the radiator when the engine is running!***
- ▶ ***Wait until the motor has cooled down before opening.***

- 1) Open the engine hood.
- 2) The unlocking screw is to the right above the radiator. Unscrew this. ▶ The radiator cap opens. The filler opening of the radiator is located under the radiator cap.
- 3) Open the radiator cap.
- 4) Fill radiators completely with coolant (observe mixing ratio antifreeze/water).
- 5) Close radiator cap.
- 6) Close radiator hatch.

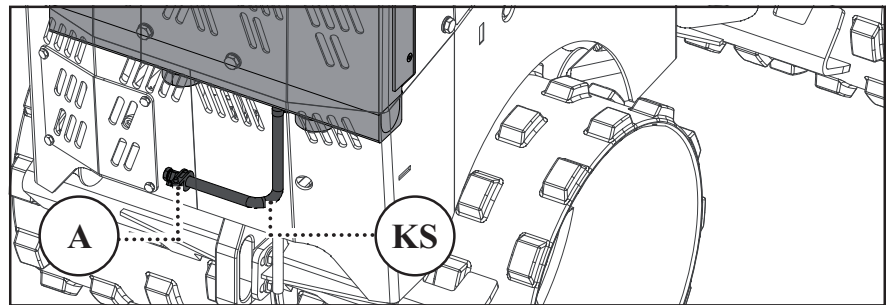
8.11 Draining /refilling cooling water

	<p><b>! DANGER</b></p>
<p><b>Risk of scalding!</b>  <i>The engine extremely heats up the cooling water. The coolant circuit is under pressure.</i>  <b>When opening the coolant circuit the pressure can escape suddenly and the hot cooling water can cause severe scalding!</b></p> <ul style="list-style-type: none"> <li>▶ <b>Never disconnect lines with a running engine.</b></li> <li>▶ <b>Only work on the cooling system after the engine has cooled down.</b></li> </ul>	

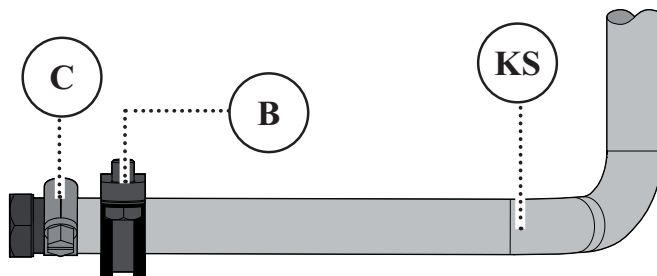


The cooling water can be drained over a hose. This cooling water drain hose leads from the radiator downward. It is attached to the connection endplate there with a hose clamp.

- 1) Park the machine on flat ground.
- 2) Loosen retaining screw of the clip **A** on the cooling water drain line **KS**.



- 3) Prepare container to collect the cooling water. ▶ The container must have a capacity of at least 4 litres and be undamaged.
- 4) Insert cooling water drain line into the prepared container.
- 5) Screw out **B** clip and plug **C** on the cooling water drain line carefully **KS**.
- 6) Open radiator cap and allow the cooling system to drain completely.

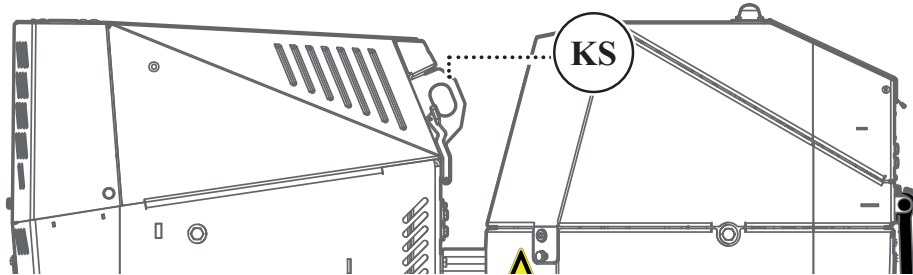


- 7) Reassemble threaded plug and cooling water drain line.
- 8) Fill cooling system with coolant ▶ observe temperature range!
- 9) Close radiator cap and check cooling system for leaktightness.

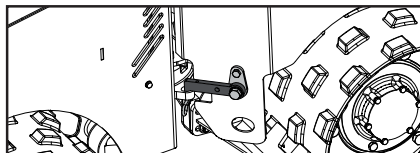
### 8.12 Exchanging drums

The machine must be lifted with appropriate hoisting gear, in order to change the drums. The hoisting gear must have sufficient carrying capacity. The machine may only be lifted at the intended transport handles (TB).

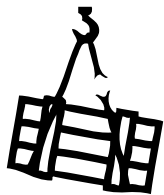
- 1) Attach transport protection.



- 2) Insert the hooks of the hoisting gear into the transport handle.

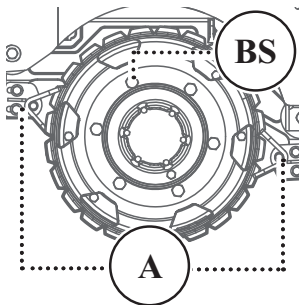


- 3) Lift the machine as far as necessary to enable convenient working.
- 4) Disassemble (A) strippers.



#### DANGER

**Death by crushing!**  
**Items can come loose and falls down!**  
 Do not walk or stand under suspended loads. Do not leave any loose items on the machine.



- 5) Release fastening bolts (BS) of the drums. Do not unscrew completely!
- 6) Lower machine until the drums are approximately 1 cm above ground.
- 7) Unscrew the fastening bolts (BS).
- 8) Hammer against the drum casing with a soft mallet, if the drums are firmly attached to the driving flange. ► The drums release themselves from the driving flange.
- 9) Clean the surface of the drum flange
- 10) Place new drums on the driving flange.
- 11) Tighten fastening bolts (BS) crosswise.
  - Tightening torque 150 Nm / 110 ft-lb

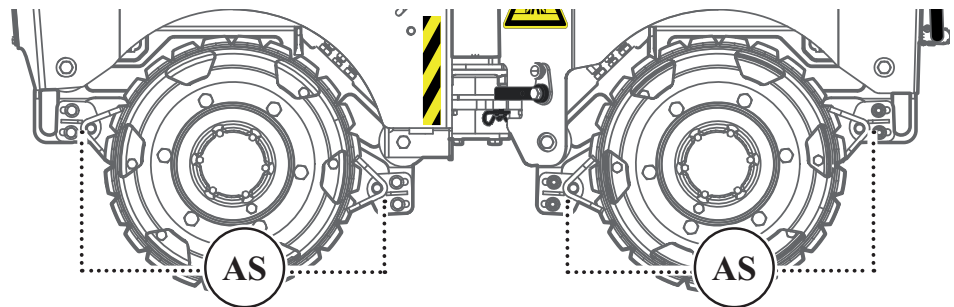
### 8.13 Adjusting stripper



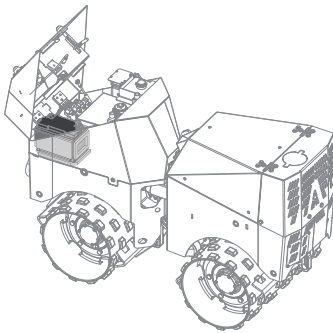
#### NOTE

*The strippers must be reset or renewed in case of wear.*

- 1) Loosen all three screws on the stripper (AS) and push stripper toward the drum.
  - ▶ The distance from stripper to drum must be at least 2 cm.
- 2) Tighten bolts again.



### 8.14 Servicing the battery

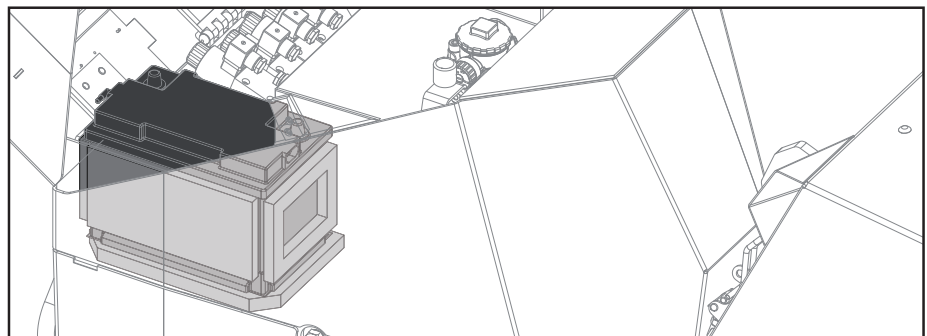


The battery is located underneath the operating panel. It is maintenance-free according to EN/DIN. That means it that during normal operating temperatures and correct controller voltage no water must be refilled. Water is used up in the case of deviation from the standard conditions. The following among others is considered as a deviation from normal conditions:


- High outside temperatures
- Demanding use of the machine
- Continuous operation on upward gradients and downward gradients within the extreme range (just below the maximum gradeability).

It is advisable to check the water level of the battery in regular intervals. The service life is reduced substantially, if the battery is operated with a too low water level.

The battery terminals and cable clips must in particular be cleaned regularly and then generously greased with petroleum jelly.






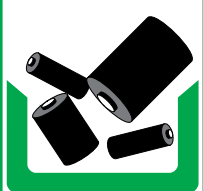
	<p style="text-align: center;"><b>WARNING</b></p> <p><b>Battery acid is extremely caustic and can cause severe chemical burns if touched.</b></p> <ul style="list-style-type: none"> <li>▶ Do not let acid get on to hands or clothes.</li> <li>▶ <b>Immediately rinse the part concerned after contact with acid and consult a doctor.</b></li> </ul>
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Checking the water level:

- 1) Open one of the sealing caps.
- 2) Check the water level. ▶ The water level must reach up to the marking.
- 3) Fill up with distilled water up to the marking, if the fill level is below the marking.

	<p style="text-align: center;"><b>NOTE</b></p> <p><b>Only use original Rammax batteries!</b>  <b>Conventional batteries are not designed for vibrations, which result during use of the machine. Rammax GmbH is not responsible for damages resulting from the use of conventional batteries.</b></p>
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	<p style="text-align: center;"><b>ENVIRONMENT</b></p> <p><b>Dispose old batteries in an environmentally friendly manner according to the respective local environmental regulations.</b>  <b>Transport damaged batteries in a suitable container.</b></p>
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## 9.0 Tightening torques:

Tightening torques for bolts with standard metric thread

Bolt dimension	Tightening torques Nm		
	8.8	10.9	12.9
M 4	3	5	5
M 5	6	9	10
M 6	10	15	18
M 8	25	35	45
M10	50	75	83
M12	88	123	147
M14	137	196	235
M16	211	300	358
M18	290	412	490
M20	412	578	696
M22	560	785	942
M24	711	1000	1200
M27	1050	1480	1774
M30	1420	2010	2400

Bolt dimension	Tightening torques ft-lb		
	8.8	10.9	12.9
M 4	2	3	4
M 5	4	7	7
M 6	7	11	13
M 8	18	26	33
M10	37	55	61
M12	65	91	108
M14	101	145	173
M16	156	221	264
M18	213	303	361
M20	304	426	513
M22	413	559	695
M24	524	798	885
M27	774	1092	1308
M30	1047	1482	1770

Strength classes for bolts with untreated, unlubricated surface. The bolt quality designation is evident on the screw heads.

**8.8 = 8G ; 10.9 = 10K ; 12.9 = 12K**

The values result in a 90% utilisation of the screw yield strength, in the case of a coefficient of friction  
 $\mu_{ges.} = 0.14$ .

Adherence to tightening torques is checked with a torque wrench. When using lubricant MoSo<sub>2</sub>, the specified tightening torques do not apply.



### NOTE

***Self-locking nuts must be renewed after dismantling!***

**10.0 Troubleshooting table**

<b>Fault:</b>	<b>Possible cause:</b>	<b>Remedy:</b>
Engine running, machine does not move!	Insufficient hydraulic oil in the hydraulic oil tank.	<ul style="list-style-type: none"> <li>• Check hydraulic oil level</li> <li>• Check the hydraulic system for leaks</li> </ul>
Engine does not start!	Too little fuel in the fuel tank.	<ul style="list-style-type: none"> <li>• Check fuel level and if necessary refill</li> </ul>

<b>Error codes and meanings</b>			
<b>Error code:</b>	<b>Meaning:</b>	<b>Possible cause:</b>	<b>Troubleshooting:</b>
FErr 1	An unknown character was received.	This signal is displayed the moment the connection to the machine controller is physically interrupted, for example in the case of cable break or released contacts.	Check the wiring to the machine controller. Replace defective parts.
FErr 2	No telegram has been received for a specific time from the machine controller.	This error indicates a cable break.	Check the wiring to the machine controller. Replace defective parts.
Err 1	Signal received from infrared transmitter, although manual control active.	The machine was started with the manual switchbox, therefore operating the infrared control transmitter is not possible.	This error disappears, as soon as no signals are received via infrared.
Err 2	Signal received from manual control, although infrared control transmitter active.	The machine was started with the infrared transmitter, therefore operating the manual switchbox is not possible.	This error disappears, as soon as no more signals are received from the manual control.
			Machine must be operated with the infrared transmitter. Turn machine off and restart with manual switchbox.
Err 3	Valid infrared signal received. Address is however incorrect.	Address of transmitter and receiver do not agree	Check and adjust the addresses between transmitter and controller.
			Co-ordinate addresses of transmitter and receiver (0-9)
Err 13	Inclination indicator triggered	Machine has tilted.	Place machine upright
	Control unit in incorrect position	Example: Installation position incorrect/incorrectly installed after repair or not fastened for test.	Check controller for position and fit and if necessary correct
Err 21	Low distance shutdown activated. This error can only occur during active infrared control.	Operator is too near to the machine	Increase distance between transmitter (operator) and machine.

**Error codes and meanings**

<b>Error code:</b>	<b>Meaning:</b>	<b>Possible cause:</b>	<b>Troubleshooting:</b>
Err 22 (Only RW 1503)	Safety opening is actuated.	Safety opening is actuated.	Unlatch safety yoke/ deactivate.
		No further errors or functions can be indicated on the display with actuated safety yoke.	Unlatch yoke before beginning work (engine start).

# OPERATION MANUAL

## HERE'S HOW TO GET HELP

PLEASE HAVE THE MODEL AND SERIAL  
NUMBER ON-HAND WHEN CALLING

### **UNITED STATES**

#### ***Multiquip Corporate Office***

18910 Wilmington Ave.  
Carson, CA 90746  
Contact: mq@multiquip.com

Tel. (800) 421-1244  
Fax (800) 537-3927

#### ***Mayco Parts***

800-306-2926  
310-537-3700

Fax: 800-672-7877  
Fax: 310-637-3284

#### ***Service Department***

800-421-1244  
310-537-3700

Fax: 310-537-4259

#### ***MQ Parts Department***

800-427-1244  
310-537-3700

Fax: 800-672-7877  
Fax: 310-637-3284

#### ***Warranty Department***

800-421-1244, Ext. 279  
310-537-3700, Ext. 279

Fax: 310-537-1173

#### ***Technical Assistance***

800-478-1244

Fax: 310-631-5032

### **MEXICO**

#### ***MQ Cipsa***

Carr. Fed. Mexico-Puebla KM 126.5  
Momoxpan, Cholula, Puebla 72760 Mexico  
Contact: pmastretta@cipsa.com.mx

Tel: (52) 222-225-9900  
Fax: (52) 222-285-0420

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Laval, Quebec, Canada H7L 6V3  
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Tel: (877) 963-4411  
Fax: (450) 625-8664

### **UNITED KINGDOM**

#### ***Multiquip (UK) Limited Head Office***

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Tel: 0161 339 2223  
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